



Budget Estimates

FISCAL YEAR **1981**

Volume III

Research and Program Management

Special Analyses

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1981 ESTIMATES

VOLUME III

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RESEARCH AND
PROGRAM
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RESEARCH AND
PROGRAM
MANAGEMENT



SUMMARY
INFORMATION

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

GENERAL STATEMENT

The Research and Program Management appropriation funds the performance and management of research, technology and test activities at NASA installations, and the planning, management and support of contractor research and development tasks necessary to meet the Nation's objectives in aeronautical and space research. Objectives of the efforts funded by the Research and Program Management appropriation are to (1) provide the technical and management capability of the civil service staff needed to conduct the full range of programs for which NASA is responsible, (2) maintain facilities and laboratories in a state of operational capability and manage their use in support of research and development programs, and (3) provide effective and efficient technical and administrative support for the research and development programs. For FY 1981, an appropriation of \$1,047,154,000 is requested.

More than 22,500 civil service personnel at ten installations and Headquarters are funded by the Research and Program Management appropriation. This civil service workforce is NASA's most important resource, the strength on which the future of space and aeronautics research activities depend. Seventy-five percent of the Research and Program Management appropriation is needed to provide for salaries and related costs of this civil service workforce. About two percent is for travel which is vital to manage successfully the Agency's in-house and contracted programs. The remaining amount of the Research and Program Management appropriation provides for the research, test and operational facility support, and for related goods and services necessary to operate successfully the NASA installations and to accomplish efficiently and effectively NASA's approved missions ■

Each of the ten NASA installations are assigned certain principal roles of fundamental importance in meeting NASA's overall program goals. These roles reflect the intrinsic competence of the installations on the basis of demonstrated capabilities and capacities. They are summarized as follows:

Ames Research Center: Principal roles are short haul aircraft and rotorcraft systems technology, computational fluid dynamics, planetary probes, and life sciences.

Dryden Flight Research Center: Principal roles are aeronautical flight testing, research and operations, as well as providing a contingency landing site for Space Shuttle flights.

Goddard Space Flight Center: Principal roles are the development and operation of earth orbital flight experiments and automated spacecraft to conduct scientific investigations and demonstrate practical applications; the management of the tracking and data acquisition activities for earth orbital missions; and management of the Delta launch vehicle program.

Johnson Space Center: Principal roles are management of the integrated Space Shuttle program and the Orbiter development project; astronaut and mission specialist selection and training; Space Shuttle mission planning, operation and control; and application of remote sensing to agricultural assessments and other earth resources uses.

Kennedy Space Center: Principal roles are the launch of payloads on expendable launch vehicles; the launch of Space Shuttle development and test flights; and preparation for the operational phase of the Space Transportation System.

Langley Research Center: Principal roles are long haul aircraft systems technology, emphasizing fuel conservation, safety and environmental effects; aerospace structures technology; environmental quality monitoring by remote sensing; and advanced space systems technology.

Lewis Research Center: Principal roles are aeronautical and space propulsion technology; space communications research and technology; space and terrestrial energy systems research and technology; and management of the Centaur expendable launch vehicle program.

Marshall Space Flight Center: Principal roles are management of the Space Shuttle main engine, solid rocket booster and external tank projects; management of NASA's development activities on the Spacelab and Inertial Upper Stage projects; management of large automated spacecraft projects such as the Space Telescope and the High Energy Astronomy Observatory; experiments in materials processing in space; and solar heating and cooling technology development and verification for the Department of Energy.

National Space Technology Laboratories: Principal roles are the support of Space Shuttle engine development and testing; regional earth resources research and technology transfer; and support functions for other Government agencies located there.

Wallops Flight Center: Principal roles are management and launch of sounding rockets and balloons; and operation of an instrumented flight range for aeronautical and space research.

The 1981 budget provides the necessary resources to apply these in-house capabilities to appropriate program activities. Detailed data on funding requirements is provided in the section on each installation. A summary description of, and the funding required by functional category, are as follows:

1. Personnel and Related Costs (\$779,991,000): Includes salaries and benefits for NASA permanent and temporary civil service people, and for personnel of other Government agencies detailed to NASA. This category also includes supporting personnel costs, such as moving expenses (excluding the associated travel of people), recruiting and personnel investigation services provided by the Office of Personnel Management, and the training of NASA civil service employees.

2. Travel (\$20,825,000): Includes the cost of transportation, per diem, and other associated expenses required for the direction, coordination and management of all NASA program activities; for contract management; for flight mission support; for travel to overseas development, launch and tracking sites; for meetings and technical seminars; and for relocation.

3. Facilities Services (\$124,971,000): Includes rental of real property; the cost of maintenance, repair and related activities; engineering; custodial services; minor modifications and alterations; and utilities services ■

4. Technical Services (\$47,496,000) : Includes the cost of general purpose automatic data processing for management activities; the dissemination of scientific and technical information derived from the research and development programs; education and informational programs; shops and other essential technical services.

5. Management and Operations Support (\$73,871,000): Includes the cost of administrative communications; printing and reproduction; administrative supplies; general purpose materials and equipment; transportation of equipment and supplies; medical services and other support.

SUMMARY OF THE BUDGET PLAN BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
Personnel and Related Costs.....	709,055	727,176	768,462	779,991
Travel.....	18,061	19,797	19,005	20,825
Facilities Services.....	99,783	113,190	112,353	124,971
Technical Services.....	42,059	42,288	40,806	47,496
Management and Operations Support.....	<u>64,850</u>	<u>62,449</u>	<u>65,560</u>	<u>73,871</u>
Total.....	<u>933,808</u>	<u>964,900</u>	<u>1,006,186</u>	<u>1,047,154</u>

SUMMARY OF CHANGES FROM THE 1980 BUDGET ESTIMATE TO THE 1980 CURRENT ESTIMATE

The changes that have occurred in NASA's Research and Program Management plans in the past year are summarized as follows:

1. A net increase in the total level of the R&PM plan of **\$41,286,000** which reflects the reduction in the appropriation request through Congressional action, the effect of civil service pay raises in **1980**, and the partial absorption of such cost increases in **1980**.

(In thousands of dollars)

1980 Budget estimate.....	964,900
Congressional action.....	<u>-5,000</u>
1980 Appropriation.....	959,900
Increased pay costs effective October 1979, pursuant to Executive Order 12165.....	51,486
Partial absorption of increased pay costs through savings in personnel costs.....	<u>-5,200</u>
1980 Current estimate.....	<u><u>1,006,186</u></u>

2. The number of employees in full-time permanent positions currently planned for the end of **1980** is 22,613, an increase of **50** above that shown in the **1980** budget. The increase results from the need to augment the Space Shuttle development workforce as the first development and operational launches approach. The costs in **1980** for these additional people are included above.

BASIS OF THE 1981 ESTIMATE

The budget estimate for **1981** of **\$1,047,154,000**, an increase of **\$40,968,000** over the current **1980** plan, provides for the personnel and related costs for 100 additional permanent full-time employees; the full year effect of currently negotiated rate increases in support contracts; increased utility rates; and increased costs of supplies, materials and equipment, which continue to rise faster than economy efforts can offset. The Research and Program Management appropriation request for **1981**, by functional category, is summarized as follows:

1. Personnel and Related Costs (\$779,991,000): The 1981 estimate for Personnel and Related Costs is based on an increase of 100 permanent full-time civil service employees over 1980. This increase is the final increment of the build-up related to Space Shuttle (75) and the full staffing of the Office of the NASA Inspector General (25). Of the 75 additional positions related to the Space Shuttle and related activities, 25 will be at Johnson Space Center, 10 at the Kennedy Space Center, and the balance at Headquarters. These positions will be used to augment the program control and monitoring function, as well as provide key technical review augmentations both in the field and in Headquarters. The 25 additional personnel for the Office of the NASA Inspector General will, in keeping with past NASA practice, be assigned to the Headquarters complement with duty stations in the field. The increase in funding of \$11,529,000 from the current 1980 plan to the 1981 request results from the cost of the additional permanent full-time personnel, the full year effect of 1980 pay increases and the net of within-grade and career advances, and turnover savings.

2. Travel (\$20,825,000): The 1981 estimate represents an increase over the current 1980 plan of \$1,820,000. The increase is needed to meet 1981 program milestones. The travel of civil service personnel to contractor plants, launch and tracking sites, technical meetings and seminars for the accomplishment and coordination of technical matters is an essential element in the success of NASA's research and development programs.

3. Facilities Services (\$124,971,000): The 1981 estimate, representing an increase of \$12,618,000 over the 1980 current estimate, is the net result of the full year effect of currently negotiated support contractor wage rates, utility rates (that are only partially offset by a further reduction of 6.8 percent in consumption), and the cost rates for supplies, materials and equipment.

4. Technical Services (\$47,496,000): The increase of \$6,690,000 in 1981 is needed to provide for the full year effect of price increases in the goods and services required in this functional category.

5. Management and Operations Support (\$73,871,000): The \$8,311,000 increase in this functional category results from the full year effect of previously negotiated support contractor wage rates and goods and services costs, and provision for the replacement of one small administrative aircraft.

In summary, the FY 1981 budget requirement is \$1,047,154,000, to provide for a civil service workforce of 22,713 permanent positions at the end of the year and to support the activities at ten NASA installations and Headquarters, consistent with the research and development and construction of facilities program plans.

A supplemental appropriation of \$46,286,000 is required in FY 1980 to partially meet the additional costs resulting from approved civil service pay raises.

DETAIL OF CONTENTS BY FUNCTION

The content of each functional category is explained in greater detail in this section, and the specific requirements for each installation are covered in their representative sections in this volume.

PERSONNEL AND RELATED COSTS

A. COMPENSATION AND BENEFITS:

1. Compensation:

a. Permanent Positions: This part of Personnel and Related Costs covers the salaries of the full-time permanent civil service workforce, and is the largest part of the functional category. As noted above, the 1981 funds will provide for 22,713 full-time permanent employees, representing an increase of 100 over the 1980 current plan.

b. Other Than Full-time Permanent Positions: This category includes the salaries of NASA's nonpermanent workforce. Programs such as students participating in cooperative training, summer employment, youth opportunity, and temporary clerical support, are covered in this category.

c. Reimbursable Detailees: In accordance with existing agreements, NASA reimburses the parent Federal organization for the salaries and related costs of persons detailed to NASA.

d. Overtime and Other Compensation: Overtime, holiday, post and night differential, and hazardous duty pay are included in this category. Also included are incentive awards for outstanding achievement and superior performance awards.

2. Benefits: In addition to compensation, NASA makes an employer's contribution to personnel benefits as authorized and required by law. These benefits include contributions to the Civil Service Retirement Fund, employees' life and health insurance, and social security contributions for nonpermanent personnel. Payments for severance pay are made to former employees involuntarily separated through no fault of their own.

B. SUPPORTING COSTS :

1. Transfer of Personnel:

Relocation costs, such as the expenses of selling and buying a home, and the movement and storage of household goods are provided under this category.

2. Office of Personnel Management Services:

The Office of Personnel Management is reimbursed for certain activities such as security investigations on new hires, recruitment advertising, and career-maturity surveys.

3. Personnel Training:

Training is provided within the framework of the Government Employees Training Act of 1958. Part of the training costs consist of courses offered by other Government agencies, and the remainder provides for training through nongovernment sources ■

TRAVEL

A. Program Travel:

The largest part of travel is for direction, coordination and management of program activities. The complexity of the programs involved and the geographical distribution of NASA Installations and contractors and subcontractors throughout the entire United States impose the requirement for this category of travel. As projects reach the flight stage, support is required for prelaunch activities, including overseas travel to launch and tracking sites. The amount of travel required for this purpose is directly related to both the number and complexity of the launches.

B. Scientific and Technical Meeting Travel :

Travel to scientific and technical meetings and seminars permits employees engaged in research and development to participate at both Government-sponsored and nongovernment-sponsored seminars. This participation allows personnel to benefit from exposure to technological advances in the field which arise outside NASA, as well as allowing personnel to present both accomplishments and problems to their associates. Many of the Government-sponsored meetings are working panels convened to solve certain problems for the benefit of the Government.

C. Management Operations Travel :

Management and operations travel includes travel for the direction and coordination of general management matters and travel by officials to review the status of programs. It includes travel by functional managers in such areas as personnel, financial management and procurement. This category also includes the cost of travel in and around the Installations; travel of unpaid members of research advisory committees; and initial duty station, permanent change of assignment, and other family travel expenses.

FACILITIES

A. Rental of Real Property:

Rental of real property includes the rental of building space directly by NASA or through the General Services Administration to meet offsite office, warehousing, and other requirements which cannot otherwise be provided for in existing buildings at the NASA Installations. Most of the funding is required for rental of the NASA Headquarters complex of buildings in the District of Columbia, and nearby Maryland and Virginia that are either Government-owned or leased for which NASA must provide rental payments to the General Services Administration in accordance with P.L. 92-313. Also included in this item is the rental of trailers required to accommodate special short-term needs.

B. Maintenance and Related Activities:

Maintenance and related activities includes the recurring day-to-day maintenance of facilities (grounds, buildings, structures, etc.) and equipment which is accomplished by non-Civil Service personnel. This involves the mowing and care of grassy areas, care of trees and shrubs, elevators, cranes, pressure vessel inspections, painting and protective coatings, general buildings maintenance, and the maintenance of installed mechanical, electrical, and other systems. In addition, this item includes feasibility studies, project design, construction supervision, inspection, and other institutional engineering functions. Included also, are any applicable costs associated with recurring facility work as well as materials, hardware, and equipment used in facility maintenance activities whether accomplished by Civil Service personnel or contractors. In the case of equipment, related maintenance and other services are reflected for office, shop, laboratory and other facilities equipment as well as administrative intercommunications and television monitoring equipment.

C. Custodial Services :

Custodial services include janitorial and building cleaning services; pest control; fire protection services; security services including badging and identification; lock and safe repair; trash and refuse handling; window blinds and light fixture cleaning; light fixture replacement; and laundry and dry cleaning of facility-related items.

D. Utilities Services:

Utilities services include the purchase of utilities including electricity, natural gas, fuel oil, coal, steam, propane, and other fuel commodities as well as water and sewage treatment services. Also included are the related operating costs of the utility plants and systems and the cost of plant maintenance.

TECHNICAL SERVICES

A. Automatic Data Processing:

1. Equipment:

This category provides for the lease, purchase and maintenance of general purpose data processing equipment which supports institutional operations at each installation. Excluded is equipment dedicated to specific research or to operational systems which is funded from the Research and Development appropriation.

2. Operations :

Operations services include programming, computer operations and related services. Institutional-type applications include payroll, personnel data, logistics, and procurement records and reports.

B. Scientific and Technical Information and Educational Programs:

1. Libraries:

The technical libraries are established to provide Installation staffs with books, periodicals, technical reports and other documentation.

2. Education and Information Programs:

The educational and informational programs provide for the documentation and dissemination of information about the agency's programs to the general public, the educational community at the elementary and secondary levels, and the mass communications media. Assistance to the mass communications media includes the assembly and exposition of newsworthy material in support of requests, and takes such form as press kits, news releases, television and radio information tapes and clips, and feature material ■

C. Shop Support and Services:

Shop support and services include general fabrications shops, reliability and quality assurance activities, safety, photographic services, graphics, and audio visual material.

MANAGEMENT AND OPERATIONS

A. Administrative Communications:

Included in this category are costs of leased lines; long distance tolls; teletype services; and local telephone service ■

B. Printing and Reproduction:

Included in this category are the costs for duplicating, blueprinting, microfilming, and other photographic reproductions. Also included in this category are Government Printing Office printing costs, contractual printing and the related composition and binding operations.

C. Transportation:

Transportation services include the operation and maintenance of all general purpose motor vehicles used by both civil service and support contractor personnel. The cost of movement of supplies and equipment by commercial carriers are also in this category.

D. Installation Common Services:

Installation common services include support activities at each installation such as: occupational medicine and environmental health; mail service; supply management; patent services; administrative equipment; office supplies and materials; operation of photocopy equipment; chart and related art work; and postage.

DISTRIBUTION OF PERMANENT POSITIONS BY INSTALLATION

<u>Installation</u>	<u>1979</u> <u>Actual</u>	<u>1980</u>		<u>1981</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
Jo Space Cente	3,504	3,445	3,469	3,494
Ke Space Cente	2,193	2,187	2,191	2,201
Ma 1 Space Flig	3,636	3,561	3,561	3,561
Na 1 Space Tech	104	103	103	103
Go Space Fligh	3,482	3,440	3,440	3,440
Wa Flight Cent	398	395	395	395
Am Search Cente	1,666	1,653	1,658	1,658
Dr Flight Resea	480	461	461	461
La Research Ce	3,005	2,990	2,980	2,980
Le esearch Cent	2,858	2,835	2,835	2,835
He rters.....	<u>1,505</u>	<u>1,493</u>	<u>1,520</u>	<u>1,585</u>
Total, Permanent Positions.....	<u>22,831</u>	<u>22,563</u>	<u>22,613</u>	<u>22,713</u>

SUMMARY OF BUDGET PLAN BY INSTALLATION (Thousands of Dollars)

Johnson Space Center.....	152,930	156,466	162,881	170,688
Kennedy Space Center.....	123,314	128,149	131,861	141,385
Marshall Space Flight Center.....	149,007	148,884	157,599	160,377
National Space Technology Lab., at.....	4,488	4,689	4,899	5,108
Goddard Space Flight Center.....	127,910	131,197	135,805	139,335
Wallops Flight Center.....	15,806	16,330	17,085	18,977
Ames Research Center.....	62,712	65,839	69,801	71,469
Dryden Flight Research Center.....	19,068	19,791	21,702	21,681
Langley Research Center.....	106,643	110,258	116,040	119,145
Lewis Research Center.....	87,457	95,800	97,825	101,360
Headquarters.....	<u>84,473</u>	<u>87,497</u>	<u>90,688</u>	<u>97,629</u>
Total.....	<u>933,808</u>	<u>964,900</u>	<u>1,006,186</u>	<u>1,047,154</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1981 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF PERMANENT POSITIONS BY PROGRAM

	1979 Actual	1980 Budget Estimate	Current Estimate	1981 Budget Estimate
<u>SPACE TRANSPORTATION SYSTEMS</u>	<u>6.575</u>	<u>6.482</u>	<u>6.475</u>	<u>6.490</u>
Space Shuttle	4.987	4.355	4.535	3.894
Space Flight Operations	1.213	1,792	1.600	2.280
Expendable Launch Vehicles	375	335	340	316
 <u>SPACE SCIENCE</u>	 <u>2,246</u>	 <u>2.085</u>	 <u>2.093</u>	 <u>2.069</u>
Physics and Astronomy	1,721	1.589	1,589	1.568
Planetary Exploration	250	238	232	226
Life Sciences	275	258	272	275
 <u>SPACE AND TERRESTRIAL APPLICATIONS</u>	 <u>2.132</u>	 <u>2.206</u>	 <u>2.200</u>	 <u>2,202</u>
Space Applications	2.041	2.131	2.110	2.115
Technology Utilization	91	75	90	87
 <u>AERONAUTICS AND SPACE TECHNOLOGY</u>	 <u>5.666</u>	 <u>5.576</u>	 <u>5,684</u>	 <u>5,773</u>
Aeronautical Research and Technology	3.723	3.772	3.733	3.772
Space Research and Technology	1,371	1.256	1.352	1,382
Energy Technology	572	548	599	619
 <u>SPACE TRACKING AND DATA SYSTEMS</u>	 <u>786</u>	 <u>786</u>	 <u>754</u>	 <u>724</u>
Tracking and Data Acquisition	786	786	754	724
 Subtotal. Direct Positions	 17.405	 17.135	 17.206	 17.258
 <u>Center Management and Operations Support Positions</u>	 <u>5,426</u>	 <u>5.428</u>	 <u>5,407</u>	 <u>5.455</u>
 Total. Permanent Positions	 <u>22.831</u>	 <u>22.563</u>	 <u>22.613</u>	 <u>22.713</u>

SUM 12

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1981 ESTIMATES
RESEARCH AND PROGRAM MANAGEMENT
DISTRIBUTION OF BUDGET PLAN BY FUNCTION BY INSTALLATION
(Thousands of Dollars)

FUNCTION	Total NASA	Johnson Space Center	Kennedy Space Center	Marshall Space Flight Center	National Space Technology Laboratories	Goddard Space Flight Center	Wallops Flight Center	Ames Research Center	Dryden Flight Research Center	Langley Research Center	Lewis Research Center	Headquarters
<u>Personnel and Related Costs</u>												
1979 Actual	709.055	16,657	69.184	119.453	3.040	107.900	10.476	51.456	14.179	88.191	74.251	54.268
1980 Budget	727.176	18,522	70.502	119.961	3.151	110.150	10.749	53.514	14.270	89.940	80.524	55.893
1980 Current	768.462	26,065	74.888	128.051	3.374	115.011	11.361	56.661	15.176	95.405	82.203	60.267
1981 Estimate	779.991	28,612	76.554	127.967	3.444	115.638	11.440	57.113	15.142	95.782	84.262	64.037
<u>Travel</u>												
1979 Actual	18.061	3.309	2.061	2.558	131	2.384	276	1.285	339	1.947	1,002	2.769
1980 Budget	19.797	3.781	2.368	2.684	99	2.672	406	1.313	415	2.154	1.208	2.697
1980 Current	19.005	3.631	2.115	2.604	137	2.542	325	1.353	394	1.899	1.169	2.836
1981 Estimate	20.825	4.035	2.255	2.982	147	2.712	347	1.446	400	2.021	1.244	3.236
<u>Facilities Services</u>												
1979 Actual	99.783	15.602	26.608	11.443	125	9.574	3.317	6.185	2.449	8.803	9.565	5.112
1980 Budget	113.190	17,667	31.421	12.395	173	10.288	3.398	7.439	2.661	10.192	10.894	5.662
1980 Current	112.353	15.922	30.392	11.825	173	10.547	3.586	7.804	3.185	10.914	11.312	5.693
1981 Estimate	124.971	18.385	34.198	12.881	286	11.816	3.771	8.736	3.150	12.537	12.307	5.904
<u>Technical Services</u>												
1979 Actual	42.059	5.901	6.615	6.541	49	2.599	575	844	408	2.296	681	15.550
1980 Budget	42.288	7.006	6.987	5.588	41	2.325	524	909	458	2.032	429	15.989
1980 Current	40.806	6.100	6.617	6.287	41	2.449	537	866	665	1.802	885	14.557
1981 Estimate	41.496	7.529	7.611	6.687	43	3.076	963	924	789	2.453	1.043	16.378
<u>Management and Operations</u>												
1979 Actual	64.850	11.461	18.846	9.012	143	5.453	1.162	2.942	1.693	5.406	1.958	6.774
1980 Budget	62.449	9.490	16.871	8.256	225	5.762	1.253	2.664	1.987	5.940	2.745	7.256
1980 Current	65.560	11.163	17.849	8.832	174	5.256	1.276	3.117	2.282	6.020	2.256	7.335
1981 Estimate	73.871	12.127	20.767	9.860	188	6.093	2.456	3.250	2.200	6.352	2.504	8.074
<u>TOTAL</u>												
1979 Actual	933.808	52,930	123.314	149.007	4.488	127.910	15.806	62.712	19.068	106.643	87.457	84.473
1980 Budget	964.900	56,466	128.149	148.884	4.689	131.197	16.330	65.839	19.791	110.258	95.800	87.497
1980 Current	1,006.186	62,881	131.861	157.599	4.899	135.805	17.085	69.801	21.702	116.040	97.825	90.688
1981 Estimate	1,047.154	70,688	141.385	160.377	5.108	139.335	18.977	71.469	21.681	119.145	101.360	97.629

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

RESEARCH AND PROGRAM MANAGEMENT

For necessary expenses of research in government laboratories, management of programs and other activities of the National Aeronautics and Space Administration, not otherwise provided for, including uniforms or allowances therefor, as authorized by law (5 U.S.C. 5901-5902): awards; *purchase (for replacement only, of one aircraft, for which partial payment may be made by exchange of at least one existing administrative aircraft and such other existing aircraft as may be considered appropriate)* hire, maintenance and operation of administrative aircraft; purchase (not to exceed [thirty-two] *thirty-six* for replacement only) and hire of *passenger* motor vehicles; and maintenance and repair of real and personal property, and not in excess of \$75,000 per project for construction of new facilities and additions to existing facilities, repairs, and rehabilitation and modification of facilities; ~~[\$959,900,000]~~ *\$1,047,154,000: Provided.* That contracts may be entered into under this appropriation for maintenance and operation of facilities, and for other services, to be provided during the next fiscal year: *Provided further.* That not to exceed \$25,000 of the foregoing amount shall be available for scientific consultations or extraordinary expense, to be expended upon the approval or authority of the Administrator and his determination shall be final and conclusive. (42 U.S.C. 2451, *et seq.*; Department of Housing and Urban Development—Independent Agencies Appropriation Act, 1980; additional authorizing legislation to be proposed.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND PROGRAM MANAGEMENT

Program and Financing (in thousands of dollars)

Identification code: 80-0103-0-1-999	Budget plan			Costs and obligations		
	1979 actual	1980 est	1981 est	1979 actual	1980 est	1981 est
Program by activities:						
Direct program:						
1. Space transportation systems	389,638	415,886	435,154	390,823	415,886	435,154
2. Scientific investigations in space	120,113	115,990	120,300	120,014	115,900	120,300
3. Space and terrestrial applications	110,451	128,700	133,000	107,252	128,703	133,000
4. Space research and technology	67,572	74,600	79,300	66,927	74,630	79,300
5. Aeronautical research and technology	178,474	199,500	207,700	176,615	199,500	207,700
6. Energy technology	24,439	28,300	30,400	24,403	28,303	30,400
7. Supporting activity	43,121	43,300	41,333	43,053	43,300	41,300
Total direct program	933,808	1,096,186	1,047,154	929,093	1,006,186	1,047,154
Reimbursable program:						
1. Space transportation systems	1,131	1,440	1,700	1,125	1,440	1,700
2. Scientific investigations in space	105	50	50	105	53	50
3. Space and terrestrial applications	5,008	7,780	4,181	4,980	7,180	4,188
5. Aeronautical research and technology	762	440	390	760	440	390
6. Energy technology	14,849	14,950	12,890	14,770	14,950	12,855
7. Supporting activity	11,818	11,330	12,790	11,749	11,330	12,750
Total reimbursable program	33,673	36,000	32,000	33,489	36,000	32,003
Total program costs funded	967,481			962,582	1,042,186	1,079,154
Change in selected resources (undelivered orders)				4,899		
10.00 Total	967,481	1,042,186	1,079,154	967,481	1,042,186	1,079,154
Financing:						
Offsetting collections from:						
11.00 Federal funds				-27,837	-28,672	-30,015
14.00 Non-Federal sources				-5,786	-7,328	-1,935
25.00 Unobligated balance lapsing				261		
Budget authority				934,069	1,006,186	1,047,154
Budget authority:						
40.00 Appropriation				936,469	959,900	1,047,154
40.01 Appropriation rescinded (Public Law 95-7, 92 Stat. 798)				-2,400		
43.00 Appropriation (adjusted)				934,069	959,900	1,047,154
44.20 Supplemental for civilian pay raises					46,286	
Relation of obligations to outlays:						
71.00 Obligations incurred, net				933,808	1,006,186	1,047,154
72.40 Obligated balance, start of year				14,276	80,798	83,184
74.40 Obligated balance, end of year				-80,798	-83,183	-81,838
77.00 Adjustments in expired accounts				-2,279		
90.00 Outlays, excluding pay raise supplemental				925,007	958,150	1,041,264
91.20 Outlays from civilian pay raise supplemental					45,050	1,236

SUM 15

INSTALLATION
JUSTIFICATION

JOHNSON
SPACE CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

LYNDON B. JOHNSON SPACE CENTER

DESCRIPTION

The Lyndon B. Johnson Space Center is located approximately 20 miles southeast of downtown Houston, Texas. Total NASA-owned land at Houston site consists of 1,620 acres. The Center also utilizes an additional 54,080 acres at the White Sands Test Facility, Las Cruces, New Mexico. The total capital investment of the Lyndon B. Johnson Space Center, including fixed assets in progress and contractor-held facilities at various locations and the White Sands Test Facility, as of September 30, 1979, was \$733,877,000.

CENTER ROLES AND MISSIONS

The Johnson Space Center (JSC) was established in November 1961, in response to the need for NASA to designate a primary Center to manage the design, development and manufacture of manned spacecraft; for selection and training of astronaut crews; and the conduct of manned space flight missions. It was necessary to focus this responsibility in a Federal laboratory since the Government was to be the customer, consumer and facility owner of an activity which was viewed as possessing considerable risk and much uncertainty because of the total lack of previous experience. This need continued as the Nation proceeded towards more ambitious undertakings such as the Apollo program, the Skylab program, the Apollo-Soyuz Test Project and the current Space Shuttle program. In order to meet this responsibility, JSC has developed unique areas of recognized technical excellence within the civil service staff and facilities of superior merit; that is, major technical facilities which constitute a national resource. The principal and supporting roles are:

PRINCIPAL

Manned Vehicles - development of manned space vehicles and associated supporting technology, including:

Space Shuttle - development of the Orbiter and lead Center for management of the Shuttle system. Providing sustaining engineering logistical support for Space Transportation System (STS) hardware. Includes Shuttle configuration management, Shuttle sustaining engineering and Orbiter operational procurement.

Advanced Missions - focus is on orbital systems and advanced transportation systems.

Environmental and Crew Support Systems - develop and demonstrate Environmental Control and Life Support Subsystems (EC/LSS) and Extra Vehicular Activity (EVA) systems suitable for the space transportation systems and other advanced needs.

Food Systems Technology - develop nutritional requirements and food processing systems in support of human space flight.

Environmental Effects Analysis - manage efforts to develop the data base and conduct analyses to ascertain any environmental impact of STS operations.

Supporting Technology Advanced Developments - development of prototypes, long lead time systems and new procedures and software for advanced systems.

Operations - operational planning, crew selection and training, medical operations, space transportation system flight control, experiment/payload flight control for attached payloads and STS utilization planning/payload accommodation studies.

Life Sciences:

Medical Research - establish human baseline data, investigate and develop countermeasures to solve space medicine problems, and develop information techniques and equipment to support medical operations and medical experiments.

Spacelab Payloads - development of Spacelab life sciences research capability through common operating research equipment development. Define, develop and integrate inflight biomedical experiments. Provide for the integration of dedicated life science Spacelab experiments and integration for human studies experiments.

Lunar and Planetary Geosciences - develop and maintain the technical discipline base for lunar and planetary geosciences and extraterrestrial sample handling techniques.

Resource Observations - provide a discipline base for resource observations applications, including airborne techniques and space-based flight sensors. Current emphasis includes the application of Landsat and other data to agricultural crop forecasting.

SUPPORTING

Technology Experiments in Space - management of Orbiter experiments program. Definition and development of experiments in areas consistent with other JSC space roles.

Energy Systems - conduct Satellite Power Systems definition activities.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	116,657	118,522	126,065	128,612
11. Travel.....	3,309	3,781	3,631	4,035
111. Facilities Services.....	15,602	17,667	15,922	18,385
IV. Technical Services.....	5,901	7,006	6,100	7,529
V. Management and Operations.	<u>11,461</u>	<u>9,490</u>	<u>11,163</u>	<u>12,127</u>
Total, fund requirements.	<u>152,930</u>	<u>156,466</u>	<u>162,881</u>	<u>170,688</u>

Distribution of Permanent Positions by Program

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems.....</u>	<u>2,581</u>	<u>2,539</u>	<u>2,535</u>	<u>2,542</u>
Space shuttle.....	2,210	1,907	2,000	1,563
Space flight operations...	371	632	535	979

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u>	1980 <u>Current</u> <u>Estimate</u>	1981 <u>Budget</u> <u>Estimate</u>
<u>Space Sciences.....</u>	<u>151</u>	<u>133</u>	<u>151</u>	<u>152</u>
Planetary exploration.....	44	39	41	40
Life sciences.....	107	94	110	112
<u>Space and Terrestrial Applications.....</u>	<u>193</u>	<u>206</u>	<u>200</u>	<u>214</u>
Space applications.....	188	202	195	209
Technology utilization... ..	5	4	5	5
<u>Aeronautics and Space Technology.....</u>	<u>34</u>	<u>30</u>	<u>40</u>	<u>46</u>
Aeronautical research and technology.....	4	3	5	8
Space research and technology.....	22	7	17	20
Energy technology.....	8	20	18	18
Subtotal, direct positions.....	2,959	2,908	2,926	2,954
<u>Center Management and Operations Support Positions.....</u>	<u>545</u>	<u>537</u>	<u>543</u>	<u>540</u>
Total, permanent positions.....	<u>3,504</u>	<u>3,445</u>	<u>3,469</u>	<u>3,494</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

PACE SHUTTLE..... 1,563

The 1981 staffing provides for continuation of design, development, **test** and evaluation activity a schedule consistent with the major program milestones including the first manned orbital flight the subsequent orbital flight tests. Activities will continue consistent with a phased delivery the total Orbiter fleet. Procurement of necessary initial flight and ground support equipment will continued.

The Space Shuttle Program Office of the Lyndon B. Johnson Space Center (JSC) has program management responsibility for program control, overall systems engineering, and Space Shuttle system integration. The Space Shuttle Program Office (SSPO) provides management of the "Lead Center" functions as related to the Space Shuttle program and the overall systems management and integration of all elements of the program. The Space Shuttle Orbiter Project Office provides overall management of the design, development, test and production of the Orbiter system. This includes management of various elements of the total Orbiter system (e.g., structures, propulsion, power, avionics, etc.) and to lower elements within the subsystems.

In order to adequately integrate all vehicle systems into an efficient operating system, many detailed interfaces and functional performance features must be identified and defined. Specific interface control documents are identified and established including both flight systems and flight to ground systems. General capability and performance criteria are established for special areas of consideration such as electromagnetic compatibility and lightning protection. For proper systems operations, systems performance data and operational information are prepared such as operational data books, mission requirement documents, etc.

Although major Shuttle flight system elements have been individually managed through designated Shuttle element project offices and related provisioning contractors, a relatively large quantity of supporting equipment is supplied to the program through other elements of JSC. Examples of such equipment are: extravehicular mobility unit, portable oxygen system, closed circuit television, survival radio sets, dosimetry, crew equipment, photographic camera systems, and bioinstrumentation. Each represents a multitude of engineering, management, and evaluation activities. These include definition of requirements, establishment of contract, management of contractor projects, evaluation of design and performance, and provisioning of equipment in a certified "ready for use" configuration. Mission use of equipment also requires on-site processing for preparation and related reconditioning for sequential missions.

Throughout the Orbiter program, particular attention is given to prediction of vehicle performance in each area of function, to analysis of design, establishment and conduct of necessary tests and rectification of actual versus predicted performance difference. Since the Orbiter represents an integrated complex of technical and engineering disciplines, specific test, evaluation and analysis sub-tasks have been assigned to the variety of technical organizations at JSC. Included in these tasks are: providing technical expertise in the Orbiter life support systems; performing engineering analysis, design definition, performance evaluation, and breadboard testing for communications and tracking systems ground testing; providing expertise in guidance, navigation, control, instrumentation and electrical power distribution; management and operation of environmental test chambers; analysis, evaluation and component testing of the Orbiter hydraulics system, auxiliary power unit, orbital maneuvering system components, reaction control engine performance, reaction control system engine

value leak detection techniques and development of initiator firing units; analysis and laboratory testing for vehicle attachment and separation systems; design analysis of total Shuttle systems, Shuttle/payload interface design, crew station evaluation and design, Shuttle airlock design evaluation, etc.; conduction of engineering analysis to determine overall vehicle performance characteristics in the area of aerodynamic performance, flight characteristics, performance, and dynamics including aeroelasticity.

The successful flight and operational performance of the Space Shuttle is dependent on the proper functioning of integrated electronic equipment. Collectively, these are termed the Integrated Avionics System. Avionics provide the Shuttle pilots and crew with the total assessment and command capability necessary to manage, fly and operate the vehicle. Because of the criticality of this system, very close attention is given to the identification of performance requirements, systems design, and integrated performance ■

A variety of avionic elements are included within the Space Shuttle system, each of which requires the attention of a group of technical experts. These elements include: guidance, navigation and control, data processing, communication and tracking; instrumentation, displays and controls, solid rocket booster control and recovery interface, power and control, and external tank propellant control and instrumentation.

Avionics and software testing and checkout in the Electronics Systems Test Laboratory and the Shuttle Avionics Integration Laboratory have effectively supported the Approach and Landing Test (ALT) effort, and will continue through the Orbital Flight Testing (OFT) and into the operations era. Their purpose is to verify the functional performance of Shuttle Integrated Avionics System and validate the system design and verify compatibility of the various radio frequency communication links.

For OFT crew training, the Orbiter Aeroflight Simulator (OAS) was upgraded to the Orbiter 102 configuration to become the second crew station (motion base) in the Shuttle Mission Simulator (SMS) complex. The fixed base is the other crew station with final systems delivery set for 1980. This complex is the primary flight crew training facility and is supplemented by a number of part task trainers and specialized training devices. Training operations began in early 1979 using the motion base portion of the SMS, and full integrated simulations were conducted with the SMS tied into the Mission Control Center in April 1979. The current training schedule requires 40 to 65 training hours per week (between the two crew stations). Involved in simulator operations are the simulator readiness tests, operation of the simulators during training exercises, documentation of abnormal operations identified in the simulator performance or configuration, and correcting problems and system malfunctions. In addition, design and program modifications must be implemented to maintain configuration with Orbiter vehicle modifications and Shuttle program changes.

The Mission Control Center (MCC) update involves the management of the design, development, integration, and testing of all MCC software required to support the Shuttle Orbital Flight Test (OFT) program. This includes modifications to old programs, new or replacement programs, their integration in the MCC, the integration of the MCC software and hardware, and software of the MCC for simulation, training, and actual flight operations. Orbital Flight Test is a major design change to the MCC software and requires new programs for the telemetry, command, tracking, and communications programs.

Orbital Flight Support includes a wide variety of planning activities ranging from operational concepts and techniques to detailed systems operational procedures and checklists. Tasks include flight system and software handbooks, flight rules, detailed crew activity plans and procedures; development of mission control center and network systems requirements; and operations input to the initial planning for the selection and operation of Shuttle OFT payloads.

Specific OFT flight planning activity encompasses the flight design, flight analysis, and software activities. The flight design tasks include: developing nominal and contingency profiles on a pre-flight basis; supporting the crew training simulations; and development of flight techniques for OFT. Specific OFT flight design products include conceptual flight profiles and operational flight profiles which are issued at launch minus twelve and three months, respectively, for each flight. The OFT software activities include the development, formulation, and verification support for the guidance, targeting, and navigation systems software requirements in the Orbiter and MCC. In addition, the flight dependent data located in the erasable memory (mission-to-mission changes) is developed from the flight design process for incorporation into the Orbiter software and MCC systems.

Orbiter Software Development provides software required for the Shuttle Orbiter Avionics (onboard) general purpose computers. This task involves the generation of the specifications; the design, development, code and test; and integration and verification of the primary avionics software systems which are loaded into the onboard computers. These computers are used for crew training in the Shuttle Mission Simulator and for the actual space flight mission. In addition, this task provides software for Orbiter vehicle tests conducted at the Shuttle launch sites (Kennedy Space Center and the Western Space and Missile Center), and in the Shuttle Avionics Integration Lab.

Permanent Positions
(Civil Service)

SPACE FLIGHT OPERATIONS

979

JSC's support of the Spacelab development effort includes establishing and controlling Shuttle interface with the Spacelab, for overall safety requirements for the Shuttle/Spacelab combination,

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and support of MSFC in the performance of its assigned responsibilities. JSC is responsible for crew training in conjunction with flight hardware, and the development and operation of Shuttle/Spacelab simulators and trainers as well as Spacelab support software resident in the Orbiter general purpose computer.

The Mission Control Center is being upgraded MCC-II and Payload Operations Control Center (POCC) for the high flight density of STS operations, payload support, and secure DOD operations. Design and implementation necessary for this upgrade includes the display, control, data handling and interface, communications, and computer hardware/software systems which are being replaced, modified, and/or supplemented. This upgrade will provide mission support for up to three Orbiters simultaneously (two inflight and one on pad or simulation), Spacelab and attached-payload command and control, and ability to separate a secure data string for DOD Shuttle mission support.

The Shuttle Mission Simulator (SMS) complex and procedures training facility will be implementing reconfiguration tools (hardware and software systems) to permit support of the high flight rate of the 1980's. The capability for near-continuous training of a number of flight crews for different types of missions, with different payload requirements and on different Orbiters, will require management and utilization of a very high volume of data. Therefore, automated tools are essential to support this pace of training. In addition, simulator system upgrades will continuously be made to keep up with changes to the Orbiters.

Orbiter avionics software development in the STS Operations era will provide for payload support. This will include general capabilities for Spacelab, Inertial Upper Stage (IUS), and Spinning Solid Upper Stage (SSUS), with flexibility available to implement specific payload requirements as optional services.

In addition, the task will provide for rapid handling of mission-to-mission software changes (flight dependent data in erasable memory) and associated verification on a "near production line" basis because of the greater mission rates. In order to accommodate the production line type of work, emphasis is being placed on software tools and the associated automatic data processing equipment (ADPE) hardware which now comprise the Software Development Lab (SDL) and the transition of support into a Software Production Facility (SPF).

Flight design for operations includes: the identification of operational requirements for the design of planned and improved spacecraft systems; the development of flight techniques for utilization of these systems; and the development of nominal and contingency flight profiles for all Shuttle missions. This will include conceptual level profile development and analysis, beginning about two years before the flight, and operational profile development and analysis, accomplished immediately prior to

the flight. As in OFT, the software activities for operational flights also include the continued development, definition, and verification support of the guidance, targeting, and navigation systems software requirements in the Orbiter and MCC. Software changes for Orbiter improvements will upgrade vehicle capabilities and performance.

The advanced programs objective is to provide technical as well as programmatic data for the definition and evaluation of potential future space programs and systems. In support of these activities, advanced studies are conducted to obtain significant performance and reliability improvements, to reduce future program risks and development costs through the effective use of new technologies, and to examine concepts and techniques which can reduce STS operations costs and mission turnaround times. In 1981, the advanced studies effort will assess the technology maturity for a Space Operations Center and examine innovative design concepts which would allow modular development of such a center. A Satellite Services Systems Analysis will be conducted to survey capabilities of proposed equipment to enhance deployment, retrieval, and servicing of payloads. Technology developments in support of Power Extension Package definition and development will be completed. Engineering and supporting studies will be conducted for all of these major disciplines.

Permanent Positions
(Civil Service)

PLANETARY EXPLORATION..... 40

The Center supports the agency's Planetary Exploration program in the area of geosciences where a strong, active research group is required to support future programs, to provide curatorial support, to assist in information dissemination and to interact with outside scientists. To provide this support the research group must make an active contribution to our knowledge of the compositions, structures and evolutionary histories of the solid bodies of the solar system. Therefore, the Center has an ongoing program of analysis of planetary materials and of remote sensing data, a theoretical studies program and a program which is involved in the development of remote sensing instrumentation. The definition of geoscience requirements for future planetary flight missions is an important role for the geoscience group which is involved in extensive cooperation with the planetary science community.

LIFE SCIENCES..... 112

The Johnson Space Center has the lead role in evaluating human physiological changes associated with the space environment and providing effective countermeasures to assure crew health and optimal performance. The scientific activities are to define, develop and integrate biomedical experiments for life sciences payloads. Additionally, these experiments are designed to utilize the space environment to accomplish medical and biological research.

The medical activities provide for medical contingencies in flight involving onboard health services, training for crewmen, ground-based medical support and medical evaluation of proposed crewmembers. These objectives are supportive of the Center's responsibility for assuring astronaut health and safety, both during flight and on the ground. The accomplishment of these objectives requires a well defined and continuing program that incorporates medical research, operations, laboratory support and clinical medicine.

The bioengineering activities provide integration of dedicated life sciences, Spacelab experiments and integration for human experiments. To this end, experiments will be selected, and experiment hardware development will be initiated. JSC is responsible for mission management of the Office of Space Science payload which includes integration of equipment to the pallet, integrating the payload into the Orbiter, and real time mission support while in orbit.

Permanent Positions
(Civil Service)

<u>SPACE APPLICATIONS</u>	209
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The resource observations discipline is divided into two major areas: technology development and applications projects, and flight projects. JSC's responsibility entails the conduct and implementation of major tasks in each of these areas.

1. Technology development and applications projects use remotely sensed data for agricultural crop identification, crop acreage and yield estimation, forest mapping and inventory, soil moisture measurement, and vegetation cover monitoring. Studies of data systems and techniques, applicable to these and other applications, are also being conducted.

2. Flight project responsibilities at JSC include the airborne instrumentation research project and Shuttle payload instrument development. The Large Format Stereo Camera is being developed for flight on the Shuttle. Responding to airborne measurement requirements, generated by NASA research and cooperative programs with the Departments of Agriculture, Interior, Defense, Commerce and Energy and various state agencies, JSC develops and implements an aircraft support plan. Involved is the testing, maintenance, and operation of a wide variety of remote sensors which provide data to investigators. Three aircraft, capable of data acquisition from 500 to 63,000 feet, are operated; a Lockheed C-130, a General Dynamics WB-57F, and a Bell 206B helicopter. They are maintained at nearby Ellington Air Force Base.

Permanent Positions
(Civil Service)

TECHNOLOGY UTILIZATION..... 5

The Technology Utilization program transfers new knowledge and innovative technology resulting from NASA's research and development programs for application in industry, medicine and important public sector areas such as urban development. The Technical Planning Office at JSC provides program office direction for the Technology Utilization program at JSC and provides engineering support to analyze the feasibility of space application to ground-based operations, such as: telecare, feeding the elderly, and bioisolation garment.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 8

JSC is continuing its efforts in fire testing aircraft fuselage sections fabricated with newly developed materials. This project provides the aircraft industry with test data and results of flammability tests on fuselage components based on full-scale fire testing. In addition, JSC is evaluating the Electromechanical Flight Control concept as an eventual replacement for aircraft hydraulic systems. Also, Fiber Optical Systems are being examined to develop a stand-alone optical multiplexer/demultiplexer component capable of bidirectional, full duplex operation with 16 channels.

SPACE RESEARCH AND TECHNOLOGY..... 20

Systems and design studies are being performed as follows: develop technology, fabricate and test a Synthetic Aperture Imaging Radar (SAR); research fuel cell and electrolysis cell technology to demonstrate suitability to large orbital energy conversion and storage requirements; identify viable propulsion system designs and propellant alternatives which could replace hydrazine fuel in a second generation Shuttle auxiliary propulsion system; collect data, using the Shuttle Development Flight Instrumentation that will augment the research and technology base for future spacecraft design; and, develop an instrumentation package which will provide flight mechanics data for the determination of aerodynamic coefficients from Orbiter flight data.

ENERGY TECHNOLOGY..... 18

Engineering manpower will be used for Space Solar Power System definition. This will involve in-house engineering definition studies and contract management. The studies will involve a systematic comparative assessment of power conversion options (photovoltaic versus thermal, silicon versus gallium arsenite, etc.); major systems trades such as the location of the space construction activity (low

earth orbit versus geosynchronous orbit); and critical systems definition (rotary joint, phase control, etc.). Also, the studies will provide for a second iteration of elements and emphasize techniques of space construction, construction base definition, logistics and operations, and definition of required development program.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

540

Center Management and Operations Support is defined as that support or service being provided to all JSC organizations which cannot be directly identified to a specific benefitting program or project. The Civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Technical Planning, and Public Affairs.

Management Support - Includes a wide range of activity categorized as business management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control, and management systems and analyses.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are: maintenance and operation of all buildings and facilities; data processing and computer support; reliability and quality assurance; Centerwide security and protection; fire protection; custodial services; logistics support including transportation, supplies, etc.; medical care of employees; and, photographic and graphic support.

RESOURCE REQUIREMENTS BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS..</u>	<u>116,657</u>	<u>118,522</u>	<u>126,065</u>	<u>128,612</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u> *				
1. <u>Compensation</u>				
a. Permanent positions..	102,749	103,366	110,210	112,208
b. Other than full time permanent positions..	<u>1,043</u>	<u>1,598</u>	<u>1,761</u>	<u>1,806</u>
c. Reimbursable detailees	1,656	1,993	2,087	2,107
d. Overtime and other compensation	<u>601</u>	<u>755</u>	<u>864</u>	<u>885</u>
Subtotal, Compensation.	106,049	107,712	114,922	117,006
2. <u>Benefits.</u>	<u>9,991</u>	<u>10,200</u>	<u>10,458</u>	<u>10,861</u>
Subtotal, Compensation and Benefits... ..	<u>116,040</u>	<u>117,912</u>	<u>125,380</u>	<u>127,867</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel..	159	145	170	175
2. Personnel training	<u>458</u>	<u>465</u>	<u>515</u>	<u>570</u>
Subtotal, Supporting Costs.....	<u>617</u>	<u>610</u>	<u>685</u>	<u>745</u>
Total, Personnel and Related Costs.	<u>116,657</u>	<u>118,522</u>	<u>126,065</u>	<u>128,612</u>

Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u>	116,040	117,912	125,380	127,867
1. <u>Compensation</u>	106,049	107,712	114,922	117,006
a. permanent Positions.....	102,749	103,366	110,210	112,208

The funds shown above will support 3,494 permanent positions in 1981. Permanent personnel staffing increases by 24 positions in 1980 from the budget estimate and by 25 positions from 1980 to 1981, but the funding increases in both years are due in large part to the October 1979 pay increases.

Basis of Cost for Permanent Positions

In 1981, the cost of permanent positions will be \$112,208,000. This increase of \$1,998,000 over the 1980 level results from the following:

Cost of permanent positions in 1980.....	110,210
Cost increases in 1981.....	+2,932
Within grade and career advances:	
Full year effect of 1980 actions.....	+929
Partial year effect of 1981 actions.....	+1,016
Full year effect of 1980 pay increases.....	+102
Cost of additional permanent positions.....	+885
Cost decreases in 1981.....	-934
Turnover savings and abolished positions:	
Full year effect of 1980 actions.....	-478
Partial year effect of 1981 actions.....	-96
One less paid day in 1981.....	-360
Cost of permanent positions in 1981.....	<u>112,208</u>

	1979	1980		1981
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full time permanent positions				
1. cost.. .. .	1,043	1,598	1,761	1,806
2. Workyears .. .	114	160	183	190

The 1981 plan includes 190 workyears which will support the following programs :

Distribution of Other than Full Time Permanent Workyears

<u>Programs</u>	<u>Workyears</u>
Cooperative training.. .. .	93
Summer employment .. .	28
Opportunity programs.....	46
Other temporary employment.	<u>23</u>
Total.	<u>190</u>

The increase in workyears from the 1980 budget to the 1980 current estimate reflects the new White House Research Apprenticeships program, the continuation of the part time program, and a build-up in the nonbaccalaureate cooperative program. The increase in 1981 is due to the scheduled build-up of the White House Research Apprenticeships program and the nonbaccalaureate cooperative program.

c. Reimbursable detailees,. .. .	1,656	1,993	2,087	2,107
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The military personnel detailed to JSC on a reimbursable basis are individuals experienced in manned flight and related fields. Each individual performs a function essential and critical to current and future programs.

Individuals with knowledge, experience, and with a flight background are essential to the manned flight programs. The individuals most readily available within the Government ranks, who meet these criteria, are military personnel. The additional requirement for keeping the military informed on manned space flight technology is also essential.

	1980		1981
1979	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
	(Thousands of Dollars)		

One civilian employee, experienced in the field of medicine, is also detailed on a reimbursable basis to JSC.

The increases in the 1980 current estimate and in 1981 are due to the October 1979 pay increases.

d. Overtime and other compensation.....	601	755	864	885
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Overtime in 1980 and 1981 will be used primarily for preparing the Space Shuttle Orbital Flight Tests, and will cover such activities as crew training, trajectory optimization, data reduction, operations in the integration laboratory, and related support activities. In addition, there are numerous source selection boards, earth resources application system verification programs, and other activities that necessitate extensions of the normal duty hours. The increases in 1980 from the budget to the 1980 current estimate, and in 1981 are due primarily to the October 1979 pay increases.

Benefits.	<u>9,991</u>	<u>10,200</u>	<u>10,458</u>	<u>10,861</u>
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Following are the amounts of contribution by category:

Civil Service Retirement Fund.....	7,322	7,288	7,714	7,951
Employee life insurance.....	297	410	310	325
Employee health insurance.....	1,825	1,892	1,802	1,854
Workman's compensation....	516	573	590	687
FICA.....	28	36	40	42
Severance pay.....	--	1	2	2
Other benefits.....	<u>3</u>	<u>--</u>	<u>--</u>	<u>--</u>
Total.....	<u>9,991</u>	<u>10,200</u>	<u>10,458</u>	<u>10,861</u>

The increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the effect of the October 1979 pay increase. The increase in 1981 is due to additional personnel and increased Workman's compensation which is based on bills received from the Department of Labor.

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
B. <u>Supporting Costs</u>	<u>617</u>	<u>610</u>	<u>685</u>	<u>745</u>
1. Transfer of personnel	159	145	170	175

Provides for continuing recruitment and transfer of personnel essential to JSC's missions. Funds required for the transfer of personnel in 1981 remain level with 1980.

2. Personnel training	458	465	515	570
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These funds provide the means to maintain proficiency in various skills, to provide the necessary training for those employees with technological expertise to keep abreast of the state of the art in their respective fields, and to meet career development and upward mobility needs. The increase in the 1980 current estimate and in 1981 is due to training vital to the implementation of the Civil Service Reform Act.

II. <u>TRAVEL</u>	<u>3,309</u>	<u>3,781</u>	<u>3,631</u>	<u>4,035</u>
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Summary of Fund Requirements

A. Program Tel	2,865	3,265	3,134	3,492
B. Scientific and Technical Development Tel	120	115	130	142
C. Management and Operations Tel	<u>324</u>	<u>401</u>	<u>367</u>	<u>401</u>
Total, Tel	<u>3,309</u>	<u>3,781</u>	<u>3,631</u>	<u>4,035</u>

	1979	1980		1981
		Budget	Current	Budget
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

Explanation of Fund Requirements

A. Program Travel.....	<u>2,865</u>	<u>3,265</u>	<u>3,134</u>	<u>3,492</u>
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Program travel is specifically required for the accomplishment of the center's mission and accounts for 87 percent of the travel budget for 1981. The decrease in 1980 from the budget to the current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. Travel to support Space Shuttle development and production is required to continue through 1981 at approximately the same level expected in 1980. However, travel requirements will increase, particularly in the area of payload development and the generation, review, and interchange of the thermal, structural, and dynamic mathematical models required for integration of the various payloads with the Shuttle and with each other,

B. Scientific and Technical Development Travel.....	<u>120</u>	<u>115</u>	<u>130</u>	<u>142</u>
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Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside JSC, as well as to present both accomplishments and problems to their associates. Many of these meetings are working panels convened to solve certain problems for the benefit of the Government. Symposia and technical seminars related to the earth observation program and lunar samples are a major requirement in this area. The level of travel in 1981 is expected to remain approximately the same as that in 1980.

C. <u>Management and Operations Travel.....</u>	<u>324</u>	<u>401</u>	<u>367</u>	<u>401</u>
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA centers; and local transportation. The decrease in the 1980 current estimate from the 1980 budget estimate reflects reduced travel in 1980 to implement Section 112 of Public Law 96-86. The increase in 1981 is related to the increased Shuttle effort.

III. <u>FACILITIES SERVICES..</u>	<u>15,602</u>	<u>17,667</u>	<u>15,922</u>	<u>18,385</u>
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The Johnson Space Center (JSC) is located on 1,620 acres with a complex of laboratory and office type buildings, as well as test facilities. This complex encompasses 2,799,141 gross square feet of building

space in 22 major buildings. Also included are 11 major technical facilities. This physical plant supports an average daily on-site population of approximately 7,100 to 7,500 personnel. Many of the test facilities are utilized on schedules involving more than one shift or during off-peak hours.

These budget estimates also include resources associated with the physical plant requirements of the White Sands Test Facility (WSTF) and for facilities used at Ellington Air Force Base (EAFB).

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
<u>Summary of Fund Requirements</u>				
A. <u>Maintenance and Related Services</u>				
1. Facilities.....	5,238	6,717	4,420	6,187
2. Equipment	--	394	--	--
	<u>5,238</u>	<u>7,111</u>	<u>4,420</u>	<u>6,187</u>
<u>Sub</u>	<u>5,238</u>	<u>7,111</u>	<u>4,420</u>	<u>6,187</u>
B. <u>Custodial Svs</u>	<u>3,195</u>	<u>3,086</u>	<u>3,450</u>	<u>3,851</u>
C. <u>Utilities</u>	<u>7,169</u>	<u>7,470</u>	<u>8,052</u>	<u>8,347</u>
Total, Facilities Svs.....	<u>15,602</u>	<u>17,667</u>	<u>15,922</u>	<u>18,385</u>

<u>Explanation of Fund Requirements</u>				
A <u>Maintenance and Related Svs</u>	<u>5,238</u>	<u>7,111</u>	<u>4,420</u>	<u>6,187</u>
1. Facilities.....	5,238	6,717	4,420	6,187

This activity involves not only the facilities of JSC at Houston, but also at White Sands Test Facility (WSTF) and Ellington Air Force Base (EAFB). It provides essentially a continuation of that level of effort provided in 1980. The reduction from the 1980 budget estimate to the 1980 current estimate reflects selected deferrals of facility projects into 1981. The 1981 estimate provides for these deferrals and the cost of negotiated support contract wage increases. Major types of support in this area are:

	1979 <u>Actual</u>	<u>1980</u>		1981 <u>Budget Estimate</u>
a. Maintenance and operation of facilities (156 workyears).....				5,172
<p>This activity includes routine maintenance and facilities support for applicable facilities at JSC and its component installations at WSTF and EAFB. Also included are such activities as support for utility systems, administrative office alterations, and painting.</p>				
b. Grounds maintenance (24 work years).....				440
<p>This provides for mowing and edging of 540 acres of improved land and mowing only of another 775 acres of unimproved land. Also included is cultivation, mulching, fertilizing, insect control, and care of trees and shrubs.</p>				
c. Facilities design engineering (20 work years).....				575
<p>This effort involves engineering design, drafting, and specifications preparation for construction of facilities; minor construction and repair projects; and other facility and system design and modification tasks.</p>				
2. Equipment.....	--	394	--	--
<p>This funding provides for maintenance and repair of office equipment and closed circuit TV maintenance and operation. This has now been reclassified as Installation Common Services,</p>				
B <u>Custodial Sis</u>	<u>3,195</u>	<u>3,086</u>	<u>3,450</u>	<u>3,851</u>
<p>This activity involves support contractor effort at JSC to provide security guard services, janitorial services, fire fighting, and ambulance services. The increase from 1980 estimate to the 1980 current estimate is partially due to an increase of four workyears of support contractor effort for increased security requirements during the Space Shuttle missions. The increase in 1981 is due to negotiated support contract wage increases.</p>				
1. Janitorial services (151 work years).....				1,968
<p>This activity provides janitorial services to some 2.55 million square feet of floor space, including highly specialized services to cleanroom areas. Also included are such activities as light bulb replacement, trash removal, and laundry services.</p>				

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
2. Fire protection services (26 workyears).....				653
This activity will provide for fire protection and other related activities for JSC property and personnel, including:				
a. Industrial safety and inspections including insuring compliance with OSHA regulations.				
b. Maintenance of alarms and fixed fire fighting equipment.				
c. Technical interface with the Houston Fire Department for actual fire fighting activities.				
3. Security services (61 workyears).....				1,230
This activity includes the protection of personnel at JSC and involves:				
a. Protection of all Government facilities and equipment.				
b. Badging of all on-site personnel and official visitors.				
c. Protecting classified information.				
d. Maintaining area surveillance and traffic control.				
C. <u>Utilities Services</u>	<u>7,169</u>	<u>7,470</u>	<u>8,052</u>	<u>8,347</u>
This category includes purchased utilities and 44 workyears of support contractor effort for the operation and maintenance of the utility distribution system at JSC. The commodity costs are as follows:				
1. Electricity (148,079 MWH).....				5,569
2. Natural gas (233,105 cubic feet)....				1,036
3. Water and Sewage.....				318
The increase from the 1980 budget estimate to the 1980 current estimate primarily reflects rate increases for natural gas and electricity. The increase in 1981 reflects these and further rate increases, partially offset by reductions resulting from conversions from natural gas to electricity and JSC's continuing conservation efforts.				

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
IV. <u>TECHNICAL SERVICES</u>	<u>5,901</u>	<u>7,006</u>	<u>6,100</u>	<u>7,529</u>

Summary of Fund Requirements

A. Automatic Data Processing

1. Equipment.....	2,355	2,300	2,453	2,703
2. Operations	<u>1,577</u>	<u>2,540</u>	<u>1,608</u>	<u>2,530</u>
Subtotal.....	<u>3,932</u>	<u>4,840</u>	<u>4,061</u>	<u>5,233</u>

B. Scientific and Technical Information

1. Pay	100	96	96	103
2. Education and Information.....	<u>1,309</u>	<u>682</u>	<u>1,385</u>	<u>1,561</u>
Staff	<u>1,409</u>	<u>778</u>	<u>1,481</u>	<u>1,664</u>

C. Shop Support and ~~Services~~.....*

	<u>560</u>	<u>1,388</u>	<u>558</u>	<u>632</u>
Total, Technical Services	<u>5,901</u>	<u>7,006</u>	<u>6,100</u>	<u>7,529</u>

Explanation of Fund Requirements

A. <u>Automatic Data Processing</u>	<u>3,932</u>	<u>4,840</u>	<u>4,061</u>	<u>5,233</u>
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This activity provides accounting and management information to satisfy requirements of NASA management and external authority. Included is support of all JSC administrative functions and the lease and maintenance costs of all multiuse ADP equipment within JSC's Central Computer Facility. The decrease in 1980 from the budget to the current estimate reflects 1979 experience with pre-FMOF requirements and a change in the phasing of the contract funding plan in the Operations area, partially offset by increased lease costs in the Equipment category. The increase in 1981 is due primarily to negotiated support contractor wage increases in the Operations area.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Equipment.....	2,355	2,300	2,453	2,703

Covered herein are the purchase and maintenance costs of all JSC-owned ADP equipment and the lease costs of all leased ADP hardware within the Central Computer Facility. These hardware systems include four Univac 1108's, one Univac 1110, one Univac 9300, one IBM 360/22, one CDC 3200, and one Mohawk (data entry) computer system. Also included is associated peripheral equipment such as two microfilm processors, various terminals, and keypunch equipment.

2. Office	1,577	2,540	1,608	2,530
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This category provides for computer programming, operations, keypunch, and other support personnel involving 70 workyears of support contractor effort. The ADP systems supported include institutional management, finance and accounting, procurement, contract status and tracking, personnel management, and utility tracking.

B. <u>Scientific and Technical Information</u>	<u>1,409</u>	<u>778</u>	<u>1,481</u>	<u>1,664</u>
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This activity, requiring 69 support contractor workyears, provides for the operation of the technical library at JSC, a public affairs educational and informational program, and support to the Center in provision of various scientific and technical information services. The increase in 1980 from the budget to the current estimate is due to the reclassification of public affairs audio-visual support to this category from Shop Support and Services. The increase in 1981 is due to an anticipated increase in support contractor wages.

1. Library.....	100	96	96	103
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Six support contractor workyears provide cataloging and indexing services and provide initial distribution of publications in the operation of the JSC Technical Library. This includes, on a monthly basis, cataloging of approximately 170 books, indexing of approximately 730 reports, and distributing about 50,000 publications.

2. Education and Information	1,309	682	1,385	1,561
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The funding in this category provides for 63 support contractor workyears to support a JSC public affairs program. Included are motion picture production, from script to screen; film clip preparation; exhibit management and refurbishment; visitor orientation tours; lecturing; mail answering services; and other public affairs activities.

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
C. <u>Shop Support and Services.</u>	<u>560</u>	<u>1,388</u>	<u>558</u>	<u>632</u>

These funds provide for 24 workyears of support contractor effort to provide JSC with support in areas such as graphics, publications, audio-visual material, microfilm and microfiche, and editorial services for JSC publications. Graphic materials are prepared for use in presentations and senior management reviews. Various kinds of film are processed, and reproductions and reprints made. The decrease from the 1980 budget estimate to the 1980 current estimate is due to the reclassification of selected public affairs audio-visual support to the Scientific and Technical Information category. The increase in 1981 is due to negotiated support contractor wage increases.

V. <u>MANAGEMENT AND OPERATIONS.</u>	<u>11,461</u>	<u>9,490</u>	<u>11,163</u>	<u>12,127</u>
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Summary of Fund Requirements

A. Administrative Communications.	2,713	2,437	2,690	2,788
B. Printing and Reproduction.....	1,131	761	997	997
C. Transportation.....	773	825	923	966
D. Installation..Commons	<u>6,844</u>	<u>5,467</u>	<u>6,553</u>	<u>7,376</u>
Total, Management and Operations.. ..	<u>11,461</u>	<u>9,490</u>	<u>11,163</u>	<u>12,127</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Administrative @mmitins.....</u>	<u>2,713</u>	<u>2,437</u>	<u>2,690</u>	<u>2,788</u>
Communications support for JSC and WSTF consist of local telephone service, long distance telephon service, and various kinds of other communications services. The 1980 current estimate is higher than the 1980 budget estimate due to a 21 percent rate increase in local telephone exchange services experie in 1979, partially offset by a decrease in costs for use of the Federal Telecommunications System (FTS). The level of support in 1981 is the same as that in 1980.				
1. Local telephone service.....				1,690
The major part of this category provides for 3,360 Centrex lines and 6,503 telephone instrument at JSC. Also included are 292 telephones at WSTF and local telephone service at Draper Labs, Cambridge MA.; Grumman, Bethpage, NY; and SAMSO, El Segundo, CA. About 128 local circuits at JSC and two at WSTF for fire alarms, burglar alarms, public address systems, and other specialized uses are also included in this category.				
2. Long distance telephone service.....				954
This category includes the cost for FTS, commercial toll calls, two dedicated voice circuits between WSTF and Las Cruces, NM, and two teletype circuits between JSC and GSA in Austin, TX.				
3. Other communications services (one workyear).....				144
These funds provide specialized services such as teletype and wire news services. In addition, the operation and maintenance of a closed circuit TV system is provided along with eight radio network for fire, security, custodial, and other uses.				
B. <u>Printing and Reproduction.....</u>	<u>1,131</u>	<u>761</u>	<u>997</u>	<u>997</u>

JSC's basic printing requirements are handled by maintaining an on-site printing plant operated by JSC personnel. This printing plant produces approximately 50,000,000 units of printing each year. In

addition to this on-site printing plant, JSC must also purchase from private firms, through Government Printing Office contracts, about 54,600,000 units each year. This purchased printing is a combination of overflow requirements that cannot be handled on-site, and printing which requires greater or different capabilities than those available at the on-site plant. The increase from the 1980 budget estimate to the 1980 current estimate and in 1981 reflects the transfer of Space Shuttle related printing from contractor effort to the on-site plant.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Transportation</u>	<u>773</u>	<u>825</u>	<u>923</u>	<u>966</u>

Transportation functions at JSC involve seven workyears of support contractor effort. Also included are administrative aircraft maintenance costs and lease of trucks from GSA. The 1980 current estimate is higher than the 1980 budget estimate due to unexpected Space Shuttle related requirements in most work areas. The level of effort for these services in 1981 is expected to be the same as that in 1980.

D. <u>Installation Common Services</u>	<u>6,844</u>	<u>5,467</u>	<u>6,553</u>	<u>7,376</u>
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These services, requiring 170 workyears of support contractor effort, support center management and staff activities, provide medical services, and cover various installation support services. These are representative areas in which the increased Space Shuttle activities have great impact. The 1980 current estimate and the 1981 estimate are higher than the 1980 budget estimate due to this impact and reflect 1979 experience.

1. Center management and staff functions.....	38
This category covers patent searches and applications.	
2. Medical services.....	1,460
Two major types of medical service are provided, occupational medicine and environmental health.	
●●Occupational medicine (33 workyears)	1,060

Occupational medicine consists of the operation of the JSC on-site clinic, emergency assistance at EAFB, providing physicals for JSC personnel at Downey, CA, medical consultation and crew test support ■

This category includes industrial hygiene , radiological health, and an environmental health laboratory.

• Administrative supplies, materials and equipment.....	2,754
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[illegible]

c. Warehousing and storage (58 workyears).....	971
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d. Postage.....	482
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e. Moving and hauling (38 was _____)	636
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	1980		1981
1979	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
	(Thousands of Dollars)		

This effort is required to handle the shipping and packing of supplies and equipment both locally and for long distance movement; the moving and hauling of items within the Center; and the delivery of supplies, materials, and equipment purchased from local suppliers.

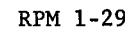
f. Forms distribution (eight workyears)..... 136

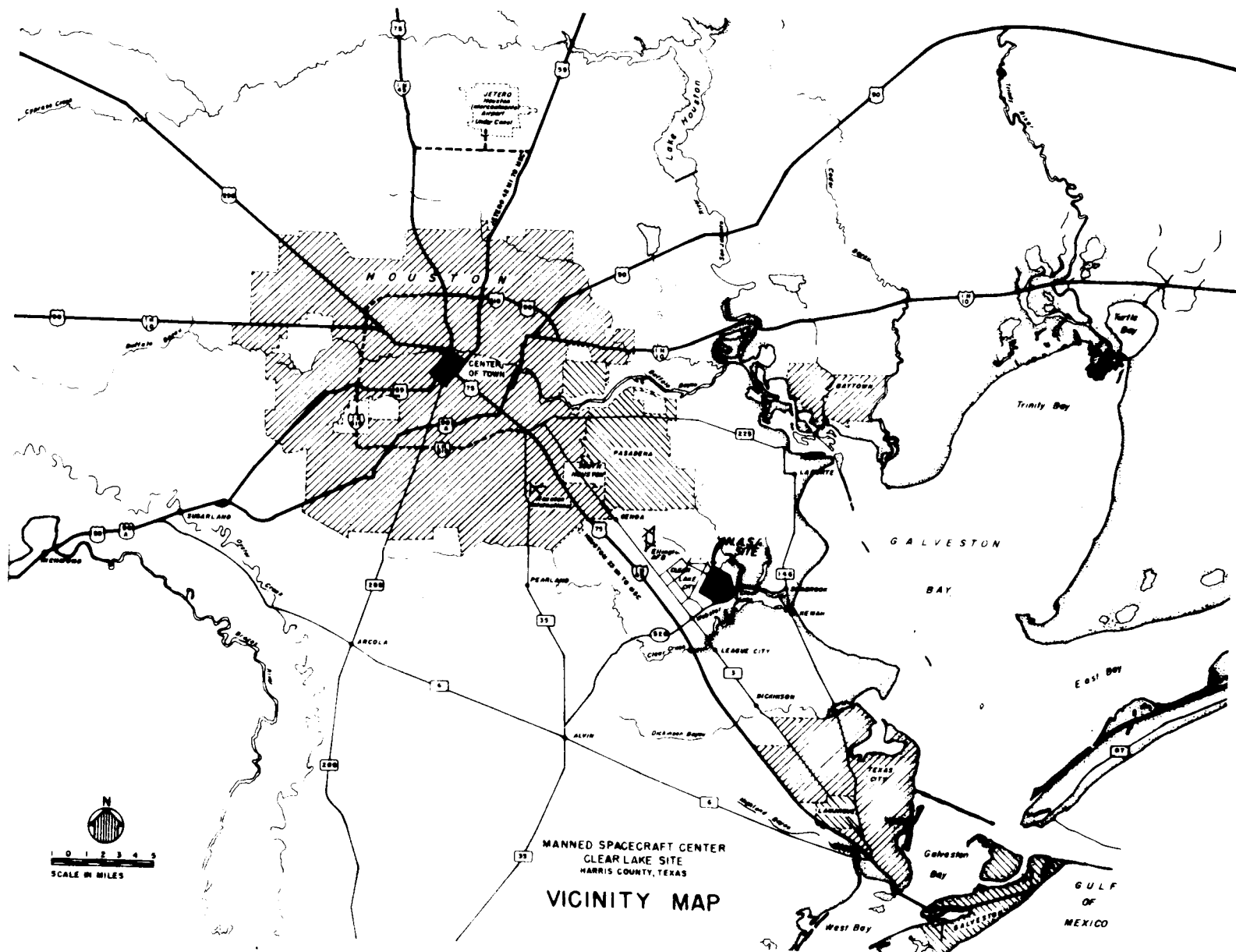
This category covers the support contractor effort required for the distribution of approximately 600,000 forms and publications each year.

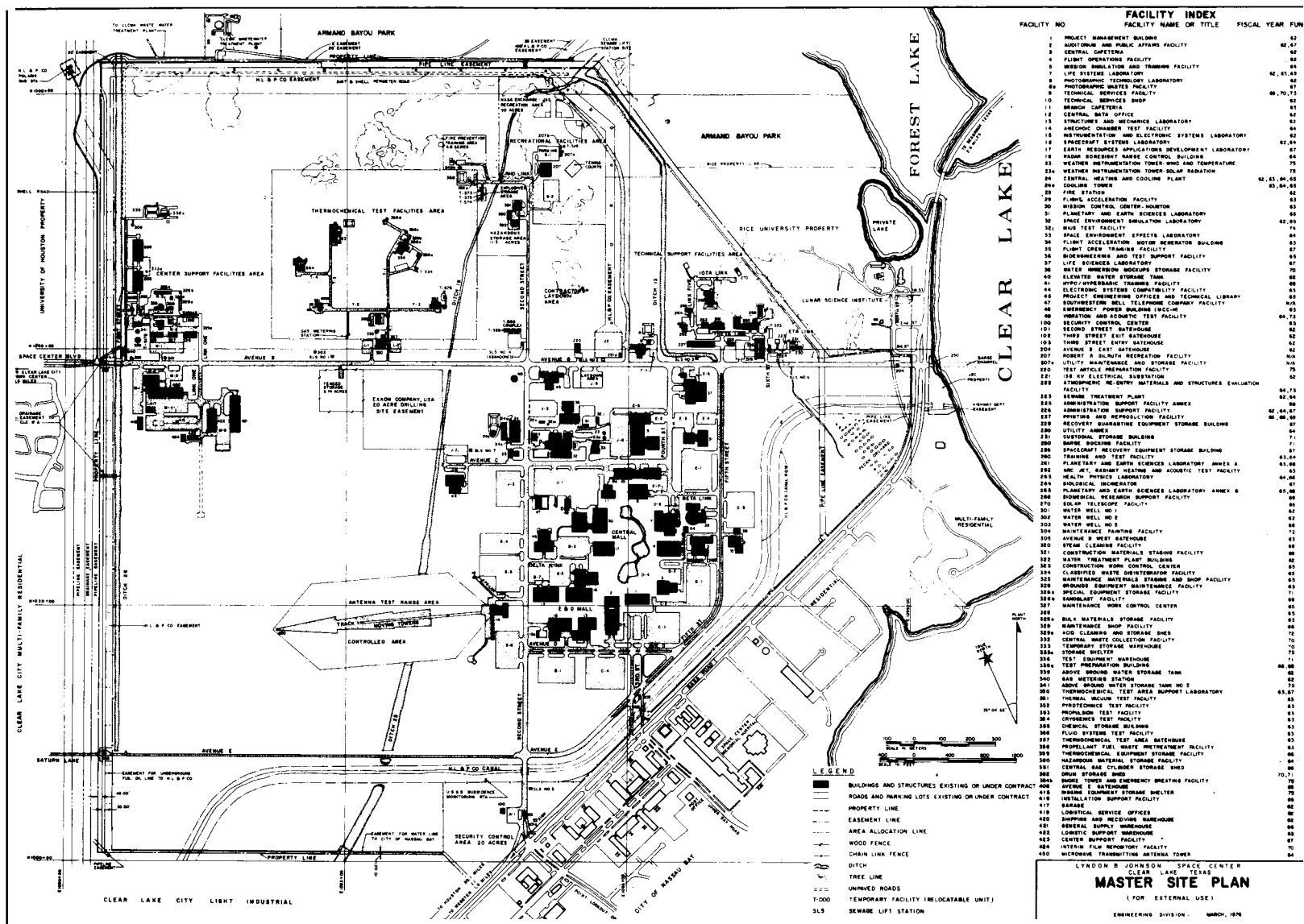
g. Administrative support..... 564

Included herein is the cost of local transportation within the JSC area provided by GSA, the JSC share of operating costs at EAFB, the costs of stenographic services and the costs of torts and claims.

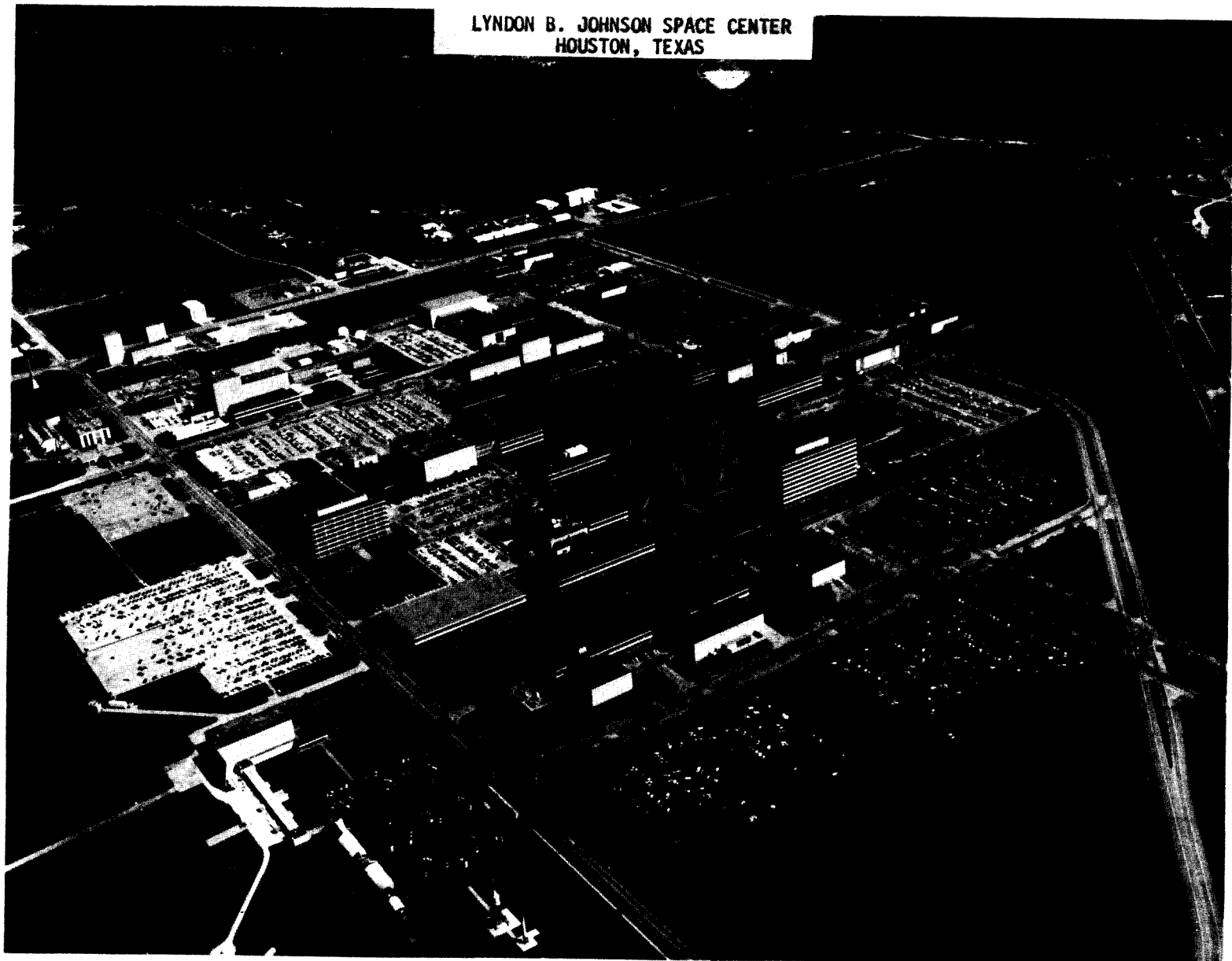
HOUSTON, TEXAS







LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS



KENNEDY
SPACE CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

JOHN F. KENNEDY SPACE CENTER

DESCRIPTION

The John F. Kennedy Space Center is located approximately 50 miles east of Orlando, Florida. The total land and water area occupied by the installation is 139,305 acres. NASA owns 82,943 acres of that total. The remainder is comprised of the Banana River Causeway Easement (271 acres), the Indian River Causeway Easement (296 acres), and Florida-owned submerged lands with Deed of Dedication (55,795 acres).

Expendable launch vehicle operations are conducted at both the Air Force's Eastern Space and Missile Center, Florida, and the Western Space and Missile Center at Vandenberg Air Force Base, California, which is located six miles west of Lompoc, California. Space Shuttle flights will begin at KSC in 1980 and at Vandenberg in 1984.

The NASA capital investment at the Kennedy Space Center and Vandenberg Air Force Base, including fixed assets in progress and contractor-held facilities as of September 30, 1979, was \$1,836,425,000.

CENTER ROLES AND MISSIONS

The Kennedy Space Center (KSC) was established at Cape Canaveral, Florida, in July 1962 to serve as the primary NASA center for the test, checkout, and launch of space vehicles. This site was chosen because of its unique geographical characteristics, climate, local growth capability, accessibility, and availability. The Center has since grown to become the major Free World launch site with a unique civil service staff of unparalleled expertise in the field of test, checkout, and launch of space vehicles and in the design of associated ground support equipment. The technical facilities developed at KSC represent a recognized national resource. The principal roles are:

Space Transportation System (STS) Ground Operations - includes launch operations, Solid Rocket Booster (SRB) retrieval, STS refurbishment and turnaround, Levels I and II integration, Spacelab Level III and IV integration, integrated logistics and transportation and postlanding operations, and flight line medical and biomedical support.

STS Sustaining Engineering - includes configuration management, operational hardware accommodations and modifications.

Expendable Launch Vehicle Operations - includes launch preparation and checkout for the current inventory of launch vehicles.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	69,184	70,502	74,888	76,554
II. Travel.....	2,061	2,368	2,115	2,255
III. Facilities Services.....	26,608	31,421	30,392	34,198
IV. Technical Services.....	6,615	6,987	6,617	7,611
V. Management and Operations.....	<u>18,846</u>	<u>16,871</u>	<u>17,849</u>	<u>20,767</u>
Total, fund requirements	<u>123,314</u>	<u>128,149</u>	<u>131,861</u>	<u>141,385</u>

Distribution of Permanent Positions by Program

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems.</u>	<u>1,609</u>	<u>1,624</u>	<u>1,603</u>	<u>1,614</u>
Space shuttle.....	1,225	1,146	1,223	1,217
Space flight operations.....	232	342	237	254
Expendable launch vehicles..	152	136	143	143

	1979 Actual	1980 Budget Estimate	Current Estimate	1981 Budget Estimate
<u>Space Science</u>	<u>2</u>	<u>2</u>	<u>8</u>	<u>8</u>
Physics and astronomy	--	--	6	6
Life sciences	2	2	2	2
<u>Space and Terrestrial Applications</u>	<u>8</u>	<u>2</u>	<u>8</u>	<u>8</u>
Space applications	6	6	6	6
Technology utilization	2	2	2	2
<u>Aeronautics and Space Technology</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>--</u>
Energy technology	<u>1</u>	<u>1</u>	<u>1</u>	<u>--</u>
Subtotal, direct positions	1,620	1,635	1,620	1,630
<u>Center Management and Operations Support Positions</u>	<u>573</u>	<u>552</u>	<u>571</u>	<u>571</u>
Total, permanent positions	<u>2,193</u>	<u>2,187</u>	<u>2,191</u>	<u>2,201</u>

PROGRAM DESCRIPTION

Permanent Positions

<u>SPACE SHUTTLE</u>	1,217
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The Kennedy Space Center (KSC) has been assigned the Launch and Landing Project of the Space Shuttle program. Major roles for the accomplishment of this responsibility include launch systems development and Space Transportation Systems (STS) ground operations. In the performance of these roles, 1981 will represent a period of continuing activity at KSC in preparation for fully operational Shuttle. Orbiter 102 will be used for the first manned orbital flight in 1980, and preparations will be in progress for three additional orbital test flights during 1981, plus the first operational flight.

Construction of new launch support facilities and modification of most existing facilities will be complete with installation and checkout of remaining support equipment in preparation for scheduled flights. Major facilities involved are:

Shuttle Landing Facility (SLF)

The installation and checkout of operational systems will be completed and along with the ground support equipment previously installed will support Shuttle landings after the fourth orbital flight test.

Orbiter Processing Facility (OPF)

Integration and checkout of all ground support systems in the Low Bay Annex and High Bay 2 will continue in preparation for arrival of the second Orbiter at KSC in 1982.

Vehicle Assembly Building (VAB)

Modification of support systems and equipment will continue in preparation for the Solid Rocket Boosters and External Tanks as well as full Shuttle integrated operations. Installation and checkout of support equipment in High Bays 1 and 2 will commence in 1982.

Mobile Launch Platforms (MLP)

Support equipment installation and checkout of MLP 2 which began in 1980 will continue.

In addition to the activity involving major facilities, KSC will continue the design, acquisition, and installation of equipment to be used in support of the Shuttle. This includes not only that equipment provided by KSC contractors but also that to be supplied by the development contractors as part of their flight vehicle contract. KSC will also continue the refurbishment of selected existing support equipment for reuse on the Shuttle program.

A unique category of support equipment is the Launch Processing System (LPS). This automated checkout system, conceived and developed by KSC, is a major innovation in the checkout and launch of sophisticated space vehicles. This system will provide automated checkout capability for the Shuttle vehicle, along with engineering data for operations and management decisions and will support the test and checkout of the first orbital flight.

Another major role for KSC in the Shuttle program, in addition to ground systems development, is that of ground operations. This includes the test and checkout of each flight element as it arrives at KSC for development flight testing, the integration of the Orbiter, External Tank and Solid Rocket Boosters into

the Shuttle vehicle and integrated testing of the stacked configuration, propellant loading, and launch. Subsequent to landing, KSC will refurbish the Orbiter in preparation for the next mission. Also included is retrieval, disassembly, and refurbishment of the expended solid rocket boosters. Since the initial orbital flight test launches will land at Dryden Flight Research Center (DFRC), provisions will be made for the ferrying of the Orbiter back to KSC (for maintenance and launch).

Permanent Positions
(Civil Service)

SPACE FLIGHT OPERATIONS

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The conduct of the space flight operations program at KSC includes Spacelab, Inertial Upper Stages, Payload support and multimission support that may be assigned for Shuttle flight operations.

KSC's role in the Spacelab program is similar to that of the Shuttle, that is; KSC is responsible for launch site development and for ground operations. With delivery of the Spacelab engineering model in 1980 and Spacelab flight equipment, KSC will continue the additional task of analytical engineering. Responsibility for this task of ensuring that the experiments to be mounted on or in the Spacelab are compatible with the Spacelab, with each other, and with safety requirements will transfer to KSC for the third Spacelab mission. The first Spacelab flight unit will be delivered in early 1981 with preparations for the first flight in 1982.

The upper stages consist of the Inertial Upper Stage (IUS) and the Spinning Solid Upper Stage (SSUS). The IUS and SSUS are expendable, propulsive stages intended for use in the deployment of Shuttle transported payloads to high energy orbits not attainable by the Shuttle alone.

The IUS is being developed by the Air Force and delivery of the first flight unit is expected in 1981. KSC will be responsible for mating the Spacecraft to the IUS. Design review of the IUS integration activities will continue in 1981 with the first flight scheduled in 1981.

Under current plans the SSUS will be developed, checked out and mated to a payload by the SSUS commercial developer. KSC will have responsibility for integration of the SSUS and its payload and then into the Shuttle payload bay.

KSC will provide facilities and support to the various payload developers and experimenters during processing at KSC. Thus, KSC, in concert with other NASA organizations must analyze potential payload requirements, identify payload facility capability at KSC, and prepare documentation for potential payload users. Based on experience gained during the Expendable Launch Vehicle program, KSC will monitor the

payload activity from conception, participate in design reviews to ensure compatibility with KSC facilities, and provide support coordination during the payload checkout and launch at KSC.

Permanent Positions
(Civil Service)

EXPENDABLE LAUNCH VEHICLES..... 143

KSC is responsible for the launch preparation and checkout of the current inventory of expendable launch vehicles. This includes the Atlas Centaur and Delta. Launches at both the Eastern Space and Missile Center and the Western Space and Missile Center are the responsibility of KSC. Fifteen launches are scheduled for 1981.

PHYSICS AND ASTRONOMY..... 6

Beginning in 1980, KSC is responsible for planning and coordinating the Level IV integration and launch site support of mission experiments for Spacelab Mission 3 and beyond. Interfaces will be established and maintained with the NASA discipline program offices, the Principal Investigators, and appropriate engineering groups to assure that scientific objectives of the mission are met.

LIFE SCIENCES..... 2

In 1981 KSC will continue its support role in the definition, development, and integration of biomedical ,experimentsinto Shuttle payloads for life sciences research. Included is the responsibility for providing and managing a Life Science Principal Investigator Support Facility and assisting in the conduct of life sciences synchronous ground control experiments and procedures required for life sciences payloads. These experiments are designed to use the environment of space to accomplish medical and biological research for the benefit of man through technological advancement of the state of the art.

Permanent Positions
(Civil Service)

SPACE APPLICATIONS 6

In the field of applications, KSC will continue in 1981 with the resources observation surveys, involving environmental monitoring, and in developing methods of sensing and predicting weather and climatic conditions.

In the area of specialized application tasks, KSC will be performing studies related to requirements, procedures, and techniques of processing space applications payloads for Spacelab.

TECHNOLOGY UTILIZATION 2

The objectives of the Technology Utilization program at KSC are to encourage the use of and to expedite the application of new NASA technology in other sectors, and to impart a better understanding of the technology transfer process and its potential impacts.

CENTER MANAGEMENT AND OPERATIONS SUPPORT 571

Center Management and Operations Support is defined as the support or services being provided to all Kennedy Space Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and the immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Public Affairs (includes operation of the Visitors Information Center and its related NASA tours activity), and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management resources control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
Data processing and computer support

RESOURCE REQUIREMENTS BY FUNCTION

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 <u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>69,184</u>	<u>70,502</u>	<u>74,888</u>	<u>76,554</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	61,459	62,396	66,459	67,780
b. Other than full time permanent positions...	825	986	922	956
c. Reimbursable detailees.....	145	26	49	35
d. Overtime and other compensation.. ..	<u>486</u>	<u>428</u>	<u>585</u>	<u>712</u>
Subtotal, Compensation.....	62,915	63,836	68,015	69,483
2. <u>Benefits</u>	<u>6,005</u>	<u>6,133</u>	<u>6,343</u>	<u>6,521</u>
Subtotal, Compensation and Benefits.....	<u>68,920</u>	<u>69,969</u>	<u>74,358</u>	<u>76,004</u>

	1979 Actual	1980 Budget Estimate Current Estimate (Thousands of Dollars)		1981 Budget Estimate
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	96	258	255	255
2. Personnel traicing.....	<u>168</u>	<u>275</u>	<u>275</u>	<u>295</u>
Subtotal, Supporting Costs.....	<u>264</u>	<u>533</u>	<u>530</u>	<u>550</u>
Total, Personnel and Related Costs.....	<u>69,184</u>	<u>70,502</u>	<u>74,888</u>	<u>76,554</u>

Explanation of Fund Requirements

A. Compensation and Benefits.....	<u>68,920</u>	<u>69,969</u>	<u>74,358</u>	<u>76,004</u>
1. <u>Compensation</u>	<u>62,915</u>	<u>63,836</u>	<u>68,015</u>	<u>69,483</u>
a. Permanent Positions.....	61,459	62,396	66,459	67,780

The funds will support 2,201 permanent positions in 1981. Permanent personnel staffing increases slightly from 1980 to 1981, but the funding increases in both years are due primarily to the October 1979 pay increase.

Basis of Cost for Permanent Positions

In 1981 the cost of permanent positions will be \$67,780,000. The increase results from the following :

Cost of permanent positions on 1980.....	66,459
Cost increases in 1981.....	+2,222
Within grade and career advances:	
Full year effect of 1980 actions	+740
Partial year effect of 1981 actions.....	+809
Full year effect of 1980 pay increases.....	+146
Change in reimbursable activity.. ..	+178
Cost of ten additional permanent positions.. ..	+349

Cost decreases in 1981.....		-901
Turnover savings and abolished positions:		
Full year effect of 1980 actions.....	-590	
Partial year effect of 1981 actions.....	-89	
One less paid day in 1981.....	-222	
Cost of permanent positions in 1981.....		<u>67,780</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full time permanent positions				
1. cost.....	825	986	922	956
2. Workyears	93	113	114	119

The 1981 plan includes 119 workyears which will support the following programs:

Distribution of Other than Full Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training	64
Summer employment	21
Opportunity programs.....	19
Other temporary employment	<u>15</u>
Total... ..	<u>119</u>

The increase in workyears from the 1980 budget estimate to the 1980 current estimate reflects the new White House Research Apprenticeships program which is offset in part by the discontinuation of the Worker Trainee Opportunity program. The decrease in the cost estimate is due to a change in skill **mix** in the temporary programs. The increase in 1981 is due to the scheduled build-up of the White House Research Apprenticeships program.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>Budget</u> <u>Estimate</u>
c. Reimbursable detailees	145	26	49	35

Provides funding for the services of a software applications officer in support of the Space Shuttle program. The increase from the 1980 budget estimate to the 1980 current estimate reflects the continuation of Shuttle requirements of the Department of Defense until the First Manned Orbital Flight (FMOF). The decrease in 1981 reflects the termination of these requirements.

d. Overtime and other compensation	486	428	585	712
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The funding increase from the 1980 budget estimate to the 1980 current estimate is due to the slip in the scheduled launch date for FMOF. This provides additional workhours to provide for the critical scheduling of Shuttle preparation efforts. The increase in 1981 is due to expected overtime to meet the orbital flight test launch schedule,

2. <u>Benefits</u>	<u>6,005</u>	<u>6,133</u>	<u>6,343</u>	<u>6,521</u>
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Following are the amounts of contribution by category:

Civil Service Retirement Fund.....	4,365	4,425	4,670	4,728
Employee life insurance.....	253	274	266	266
Employee health insurance.....	1,169	1,211	1,211	1,211
Workman's compensation	197	197	170	290
FICA	<u>21</u>	<u>26</u>	<u>26</u>	<u>26</u>
Total.....	<u>6,005</u>	<u>6,133</u>	<u>6,343</u>	<u>6,521</u>

The increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the effect of the October 1979 pay increase. The increase in 1981 is due to additional personnel and increased Workman's compensation which is based on billings received from the Department of Labor.

B. <u>Supporting Costs</u>	<u>264</u>	<u>533</u>	<u>530</u>	<u>550</u>
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1. Transfer of personnel	96	258	255	255
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Provides for continuing recruitment and transfer of personnel essential to KSC's Space Transportation Systems missions. Funds required for the transfer of personnel in 1981 remain level with 1980. The 1981 estimate provides for 57 relocations at an average cost of \$4,500 each.

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 <u>Budget Estimate</u>
2. Personnel training	168	275	275	295

These funds provide the means to maintain proficiency in various skills, to provide the necessary training for those employees with technological expertise to keep abreast of the state of the art in their respective fields, and to meet career development and upward mobility needs. The increase in 1981 is due to training vital to the implementation of the Civil Service Reform Act.

11. <u>TRAVEL</u>	<u>2,061</u>	<u>2,368</u>	<u>2,115</u>	<u>2,255</u>
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Summary of Fund Requirements

A. Program Travel.....	1,060	1,209	1,054	1,177
B. Scientific and Technical Development Travel.....	13	12	12	12
C. Management and Operations Travel.....	<u>988</u>	1,447	<u>1,049</u>	<u>1,066</u>
Total, Travel.	<u>2,061</u>	<u>2,368</u>	<u>2,115</u>	<u>2,255</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>1,060</u>	<u>1,209</u>	<u>1,054</u>	<u>1,177</u>
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Program travel is directly related to the accomplishment of KSC's mission and accounts for approximately 52 percent of the Center's travel budget. Program travel has reflected the Center's involvement in the design and manufacturing of Space Shuttle ground system equipment, design and construction of Shuttle facilities, and the activation of systems manufactured at off-site locations.

During 1980 and 1981, our effort will be directed toward the test, checkout, and launch of the First Manned Orbital Flight (FMOF). Travel to Dryden Flight Research Center, the landing site of the Orbital Flight Tests (OFT), will be required. However, the 1980 current estimate is lower than the 1980 budget estimate due to the slip in the launch date for FMOF and the other OFT flights.

The Spacelab hardware delivery schedule calls for the Engineering Model to be delivered in 1980 and the first flight unit in early 1981. Support of this schedule will cause significant travel to Europe in 1980 to participate in combined procedures development and to run subsystems and systems tests of the Engineering Model. Additional travel will be required in the development of operational software to be run on the Engineering Model and the first flight unit. The travel will continue in 1981 to support continuing systems tests on the Engineering Model and the tests that will be performed on the flight unit prior to its delivery to KSC. Also, the operational software development will continue on through the delivery of the flight unit to KSC.

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u>	1981 <u>Budget</u> <u>Estimate</u>
B. <u>Scientific and Technical Development Travel</u>	<u>13</u>	<u>12</u>	<u>12</u>	<u>12</u>
Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside KSC, as well as to present both accomplishments and problems to their associates. Many of these meetings are working panels convened to solve certain problems for the benefit of the government. It is planned that 1981 travel will be at the same level as 1980.				
C. <u>Management and Operations</u>	<u>988</u>	<u>1,147</u>	<u>1,049</u>	<u>1,066</u>

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The increases in both 1980 and 1981 from 1979 are due to increased requirements for local travel brought about by the significant increases in on-site population for Shuttle OFT preparations.

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 <u>Budget</u> <u>Estimate</u>
111. <u>FACILITIES SERVICES</u>	<u>26,608</u>	<u>31,421</u>	<u>30,392</u>	<u>34,198</u>

Kennedy Space Center (KSC) is located on 139,305 acres and has a complex of facilities which are made up of test and office buildings, as well as launch operations facilities. This complex encompasses 5,337,276 gross square feet of building space, including 13 major buildings. Also included are 14 major technical facilities. This plant supports an average daily on-center population which has grown to approximately 13,000 personnel. Many of the test facilities are utilized during off-peak hours or on more than one shift. A substantial increase in services is required in 1981 to meet the needs of Shuttle support activities and the increasing on-site population. The budget estimate also reflects the needs of KSC's component installation on Vandenberg Air Force Base (VAFB).

Summary of Fund Requirements

A. <u>Rental of Real Property</u>	<u>1</u>	<u>110</u>	<u>210</u>	<u>140</u>
B. <u>Maintenance and Related Services</u>				
1. Facilities.....	6,849	6,841	6,738	7,884
2. Equipment.....	<u>544</u>	<u>847</u>	<u>673</u>	<u>665</u>
Subtotal... ..	<u>7,393</u>	<u>7,688</u>	<u>7,411</u>	<u>8,549</u>
C. <u>Custodial Services</u>	<u>10,257</u>	<u>12,450</u>	<u>12,076</u>	<u>14,494</u>
D. <u>Utility Services</u>	<u>8,957</u>	<u>11,173</u>	<u>10,695</u>	<u>11,015</u>
Total, Facilities Services.....	<u>26,608</u>	<u>31,421</u>	<u>30,392</u>	<u>34,198</u>

Explanation of Fund Requirements

A. <u>Rental of Real Property</u>	<u>1</u>	<u>110</u>	<u>210</u>	<u>140</u>
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This provides for the rental of off-site facilities for news and receptions center activities associated with launches and other major public events. The increase from the 1980 budget estimate to the 1980 current estimate is due to cost escalation; the decrease in 1981 reflects a decline in guest related activities after the first few Space Shuttle flights have been accomplished.

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1981 <u>Budget</u> <u>Estimate</u>
B. <u>Maintenance and Related Services</u>	<u>7,393</u>	<u>7,688</u>	<u>7,411</u>	<u>8,549</u>
1. Facilities.	6,849	6,841	6,738	7,884

This activity involves the operation and maintenance of applicable facilities at KSC, Cape Canaveral Air Force Station (CCAFS), and VAFB. The size, complexity, and wide geographical dispersion of these facilities places heavy demands on facilities services. The decrease from the 1980 budget estimate to the 1980 current estimate is due to the deferral of some facility projects and purchases of supplies and materials. These deferrals are reflected in the growth in 1981 which is due also to increased intra-center moves as KSC prepares for the fully operational mode of Space Shuttle activities.

a. Maintenance and operation of facilities (153 workyears) 4,591

This activity includes, in addition to the normal activities associated with facility maintenance or management of direct maintenance personnel, the responsibilities for space utilization, utility rate studies and analysis, as well as corrosion control and cathodic protection activities.

In addition, there are minor facility related services for such items as payment of certification fees for facility maintenance at VAFB, and internal moves of personnel and related plant rearrangements.

b. Grounds maintenance (37 workyears) 1,144

This involves the provision of grounds maintenance and related supplies and equipment as well as reimbursement to the Air Force for the maintenance of NASA facilities at CCAFS.

c. Facilities design engineering (28 workyears) 836

This effort involves inspecting, siting, and other engineering functions associated with institutional facilities.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
d. Supplies and facilities equipment.....				604
These funds provide for building materials, hardware, metals, plumbing supplies, electrical materials, and general maintenance and operating materials.				
e. Routine facilities work (16 workyears)				709
Minor construction, repair, and alteration projects are included in this category.				
2. Equipment	544	847	673	665
This funding provides for 18 workyears of support contractor effort and related supplies and equipment required for maintenance and repair of heavy equipment items. The decrease from the 1980 budget estimate to the 1980 current estimate is due to reduced equipment purchases consistent with 1979 experience.				
C. <u>Custodial Services</u>	<u>10,257</u>	<u>12,450</u>	<u>12,076</u>	<u>14,494</u>
The demand for these services will continue to increase, especially for janitorial, fire protection, and security services in 1981 as the Space Shuttle program continues through Orbital Flight Tests (OFT). An increase of 59 workyears from 1979 is reflected in the 1980 current estimate and the estimate for 1981.				
1. Janitorial services (117 workyears)				2,744
This activity provides janitorial services to some two million square feet of KSC floor areas, including highly specialized services to cleanroom areas.				
2. Fire protection services (113 workyears)				3,341
This activity will provide for fire protection service for KSC property and personnel, including:				
a. Support of increasing hazardous tests and operations and Shuttle Orbiter landings.				
b. Performing fire drills and fire inspections of facilities and equipment.				
c. Providing fire protection instructions.				
d. Fighting fires.				
This estimate reflects the full activation of both KSC fire stations for Shuttle operations.				

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. Security services (254 workyears)				6,527
This activity includes the protection of personnel and property at KSC and involves:				
a. Support of increasing hazardous tests and operations.				
b. Badging of all on-site personnel and official visitors.				
c. Safeguarding flight hardware and other items of high intrinsic value arriving for OFT.				
d. Protecting classified information.				
e. Maintaining area surveillance and traffic control.				
4. Other related activities				1,882
These activities are as follows:				
a. Janitorial services and security services performed on NASA facilities at CCAFS for which the Air Force is reimbursed.				
b. Pest control services for KSC which involves five workyears of support contractor effort.				
c. Laundry services at both KSC and VAFB.				
d. Provision of supplies and equipment related to custodial services.				
D. <u>Utilities Services</u>	<u>8,957</u>	<u>11,173</u>	<u>10,695</u>	<u>11,015</u>

The major utility service at KSC is electrical energy purchased from Florida Power and Light Company through an Air Force contract. Fuel oil is purchased from a local supplier. Steam service is provided by the Air Force at CCAFS. Water services are purchased from the City of Cocoa and sewage treatment is accomplished on-site.

At VAFB, utility services are purchased through the Air Force.

Utility plant operations and maintenance and utility distribution systems maintenance are provided in this activity, which also covers reimbursement to the Air Force for these services. These services involve 71 work-years of support contractor effort. The commodity costs are as follows:

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Electricity (184,100 MWH).....				7,076
2. Fuel Oil (2,195,000 gallons)				989
3. Steam (51,700 lbs.)				334
4. Water and Sewage.....				113
5. VAFB - all utilities.....				170

The decrease from the 1980 budget estimate to the 1980 current estimate is a reduction in electricity and fuel oil rate estimates and a reduction of ten support contractor workyears, reflecting 1979 experience. The 1981 increase is due to higher utility rates. Contractor workyears are level.

IV. <u>TECHNICAL SERVICES....</u>	<u>6,615</u>	<u>6,987</u>	<u>6,617</u>	<u>7,611</u>
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Summary of Fund Requirements

A. Automatic Data Processing

1. Equipment.....	731	464	823	878
2. Operations.....	<u>3,292</u>	<u>3,456</u>	<u>3,453</u>	<u>3,588</u>
Subtotal.	<u>4,023</u>	<u>3,920</u>	<u>4,276</u>	<u>4,466</u>

B. Scientific and Technical Information

1. Library.....	365	377	374	404
2. Education and Information.....	<u>1,651</u>	<u>2,311</u>	<u>1,420</u>	<u>2,156</u>
Subtotal... ..	<u>2,016</u>	<u>2,688</u>	<u>1,794</u>	<u>2,560</u>

C. Shop Support and Services.....

Total, Technical Services.....	<u>6,615</u>	<u>6,987</u>	<u>6,617</u>	<u>7,611</u>
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Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u><i>Automatic</i></u>	<u>4,023</u>	<u>3,920</u>	<u>4,276</u>	<u>4,466</u>

These funds provide for the cost of general management ADP programs including the lease, purchase, and maintenance of ADP equipment and programming and operations services.

1. Equipment.....	731	464	823	878
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The funding shown here provides for the maintenance and lease of KSC's Honeywell 635 and supporting equipment.

The increase from the 1980 budget estimate to the 1980 current estimate is primarily due to the lease of a Honeywell 66-60 dedicated to the Center's computerized supply management system. The increase in 1981 reflects increased costs for the same equipment plus minor amounts for maintenance of the financial management system.

2. Operations.....	3,292	3,456	3,453	3,588
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One hundred and thirty eight support contractor workyears provide programming services for payroll, general accounting, supply reports, procurement, contract reports, technical support information retrieval, preventive maintenance reports of vehicle components and ground support equipment, contract surveillance reports, status reports for the KSC Personnel Office, security reports, and resources and financial management reports.

The 1981 increase is due to wage increases, partially offset by a reduction of eight workyears as programming of the financial management system nears completion.

B. <u>Scientific and Technical Information</u>	<u>2,016</u>	<u>2,688</u>	<u>1,794</u>	<u>2,560</u>
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This funding provides for operation of a technical library at KSC and for various technical and administrative documentation services throughout the center, including support to Public Affairs' educational and informational program.

1. Library.....	365	377	374	404
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Sixteen support contractor workyears are required to operate the KSC library facilities. The cost includes technical reports and literature in hard copy and microfiche; scientific, technical, and management books and periodicals; military, federal, and professional society specifications and standards are also included. The contractor also operates a Space Shuttle/Spacelab documents repository which catalogs, classifies, and indexes documents for storage and retrieval; and provides document reference and distribution services. This category also includes supplies used by the contractor. In 1981, the increase is due to wage escalation; workyears are level.

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
2. Education and Information.....	1,651	2,311	1,420	2,156

The funding in this category provides for 75 support contractor workyears to prepare publications pertaining to the receipt, checkout, and launch of space vehicles, Space Shuttle/Spacelab activities, design engineering functions, and the institutional support. Subject matter covers tracking, facility modifications, booster recovery, earth resources, future programs, launch processing, vehicle tests, checkout operations, safety procedures, materials analysis, radiological controls, and contingency plans.

Public Affairs support provides for the gathering and dissemination of information about the agency's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary levels. It also includes photographic support at Vandenberg Air Force Base, which is primarily for public affairs activities.

The decrease from the 1980 budget estimate to the 1980 current estimate reflects an alteration in the phasing of the support contract plan, as well as a reclassification of photographic services to the Shop Support category. The 1981 estimate reflects the full year cost of a ten workyear increase in the support contract which was initiated in 1980 due to Shuttle requirements.

C. <u>Shop Support and Services</u>	<u>576</u>	<u>379</u>	<u>547</u>	585
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These funds provide for a support contractor to perform technical support services, such as exercising coordinative control support activities to assure a constant state of readiness to support test/launch operations. It includes disaster and hurricane planning performed on centerwide basis through coordination with the KSC Emergency Preparedness Officer (one workyear), and training of all KSC personnel engaged in hazardous occupations (five workyears).

The increase from the 1980 budget estimate to the 1980 current estimate is due to a reclassification of photographic services from the Education and Information category. The increase in 1981 is due to wage escalation.

	1979 <u>Actual</u>	<u>1980</u> Budget <u>Estimate</u> Current <u>Estimate</u> (Thousands of Dollars)		1981 Budget <u>Estimate</u>
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>18,846</u>	<u>16,871</u>	<u>17,849</u>	<u>20,767</u>
<u>Summary of Fund Requirements</u>				
A. Administrative Communications.....	2,744	2,359	2,554	2,617
B. Printing and Reproductions.....	4,376	3,706	3,816	5,002
C. Transportation.....	2,822	2,735	3,416	4,141
D. Installation Common Services.....	<u>8,904</u>	<u>8,071</u>	<u>8,063</u>	<u>9,007</u>
Total, Management and Operations.....	<u>18,846</u>	<u>16,871</u>	<u>17,849</u>	<u>20,767</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Administrative Communications</u> ...	<u>2,744</u>	<u>2,359</u>	<u>2,554</u>	<u>2,617</u>

These funds provide for the costs of local telephone service, Federal Telecommunications System (FTS), long distance tolls, and teletype services in support of all NASA and contractor personnel located at KSC, Cape Canaveral Air Force Station (CCAFS), and Vandenberg Air Force Base (VAFB). The increase from the 1980 budget estimate to the 1980 current estimate provides for additional services associated with an increased on-site contractor population.

1. Local telephone service.....	1,779
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This category provides for the total KSC population, including contractors, and includes the administrative telephone switchboard, single line telephones for special areas, telephones acoustically coupled for data transmission, and local exchange lines for Brevard and Orange County locations.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
2. Long distance telephone service.....				812
<p>NASA contractors and other institutions who conduct official business with KSC are widely dispersed throughout the United States. KSC utilizes FTS and other leased lines to minimize costs. Service is provided to authorized users, including on-site contractors. Paid long distance and GSA leased lines are in this category.</p>				
3. Other communications services.....				26
<p>These funds provide specialized services such as teletype and wire news services. In addition, the lease and maintenance of various small electrical/electronic systems such as printers which support major communications systems are included.</p>				
B. <u>Printing and Reproduction</u>	<u>4,376</u>	<u>3,706</u>	<u>3,816</u>	<u>5,002</u>
<p>This category includes the printing of test and checkout procedures, launch countdowns, microfilming, engineering drawings, telemetry data, and other related technical and administrative material.</p> <p>The estimate for administrative printing includes long lead time items such as forms production and minor efforts, such as the KSC house organ, and miscellaneous special requirements for duplicating, photostating, blueprinting, microfilming, and other photographic reproductions. Services are performed by other government agencies or by commercial printing firms under contract to the Government Printing Office (GPO). The 1980 current estimate is higher than the 1980 budget estimate due to an 18 workyear increase in support contractor effort initiated to meet the increasingly heavy demand of Space Shuttle activities. The 1981 estimate reflects the full year cost of this additional effort.</p>				
1. Scientific and technical printing (104 workyears)				3,619
<p>This level of support contractor effort is required to print or reproduce an average of 10.8 million units per month. Supplies used by the contractor and replacement equipment are included in this category.</p>				

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 <u>Budget</u> <u>Estimate</u>
2. Administrative printing.....				456
This estimate includes the cost of services provided through the GPO, Patrick Air Force Base, and VAFB.				
3. Office copiers.....				927
This provides for office copier service to the total on-site population, civil service and contractor. Copiers are located in central service centers and individual offices where workload justifies assignment. This arrangement has proven to be an economical way of providing the service.				
C. <u>Transportation</u>	<u>2,822</u>	<u>2,735</u>	<u>3,416</u>	<u>4,141</u>
The center provides a centralized motor pool, operated by GSA, for civil service and support contractor personnel. The movement of supplies and equipment by commercial carrier is included in this area. This category also includes the operation of heavy equipment, and related supplies and materials, and aircraft operations. The increase from the 1980 budget estimate to the 1980 current estimate is due to an increased reliance on transportation capabilities related to supply operations. This shift is reflected in the Installation Common Services category. The increase in 1981 is due to an increase of four support contractor workyears to cover increased supply activity associated with increasing on-site population and Space Shuttle activity, as well as support contract wage escalation.				
1. Truck rental.....				2,147
This category provides for 545 cargo-type vehicles.				
2. Common carrier and related services (32 workyears).....				1,329
This effort is required to perform the transportation management functions, which include coordination, check, inspection, document control of all shipments, and delivery of in-bound shipments. The balance of this requirement is supplies used by the support contractor; minor contracts for off-site packing and crating services; landing fees, maintenance and repair, and supplies and equipment associated with the administrative aircraft.				

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

3. Heavy equipment (11 workyears) 665

This support contractor effort is required to operate KSC-owned heavy equipment such as tractors, cranes, trailers, and trucks. The balance is for supplies.

D. Installation Common Services. 8,904 8,071 8,063 9,007

These funds provide for logistics services, mail and distribution services, medical services, Center management and staff activities, and a wide variety of minor contracts for special and one-time services. The decrease of the 1980 current estimate from 1979 reflects an eleven workyear decrease in supply management, which was reclassified as Transportation, and a change in contract phasing plans. The increase in 1981 is due to eleven additional workyears in supply management to support line item growth associated with increasing on-site population, as well as contractor wage increases.

1. Center management and staff functions 186

This category includes tort claims, notary public fees, court reporting costs, patent counsel representation, and equal opportunity activities.

2. Medical services. 2,135

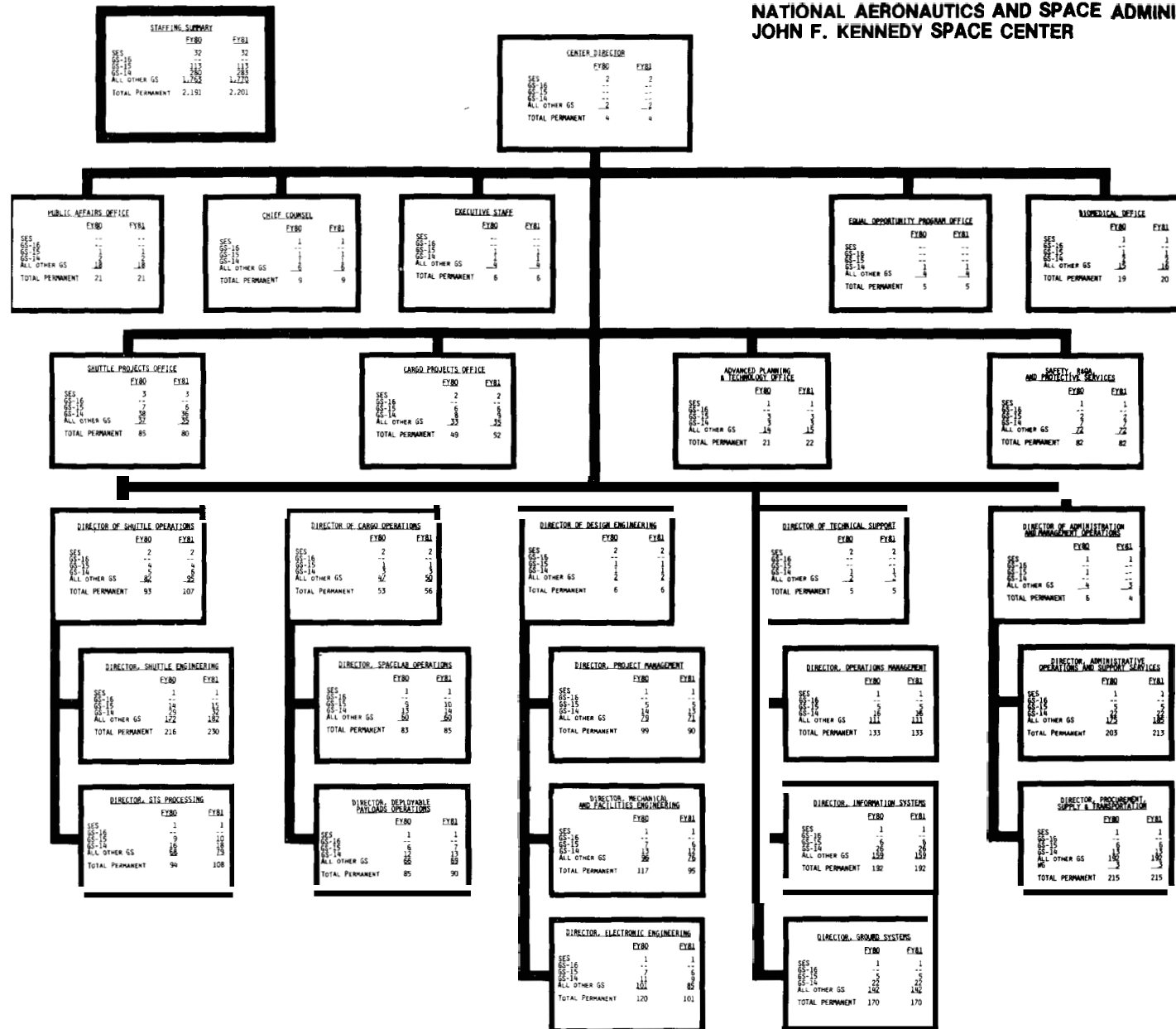
Two major types of medical services are provided, occupational medicine and environmental health.

a. Occupational medicine (62 workyears) 1,834

This effort is required to provide emergency and first aid care for the KSC workforce, guests, and tour visitors; health maintenance and counseling for civil service employees; and a variety of physical examinations and special programs for health maintenance, applied research, and job certification for civil service and contractor personnel. The contractor has also been charged with insuring Occupational Safety and Health Administration standards compliance for all KSC elements. The medical program operates on a three-shift basis to provide emergency and ambulance services and special standby service in support of hazardous tests and operations. This category also covers supplies and equipment used by the contractor and a minor contract at VAFB, primarily for physical examinations.

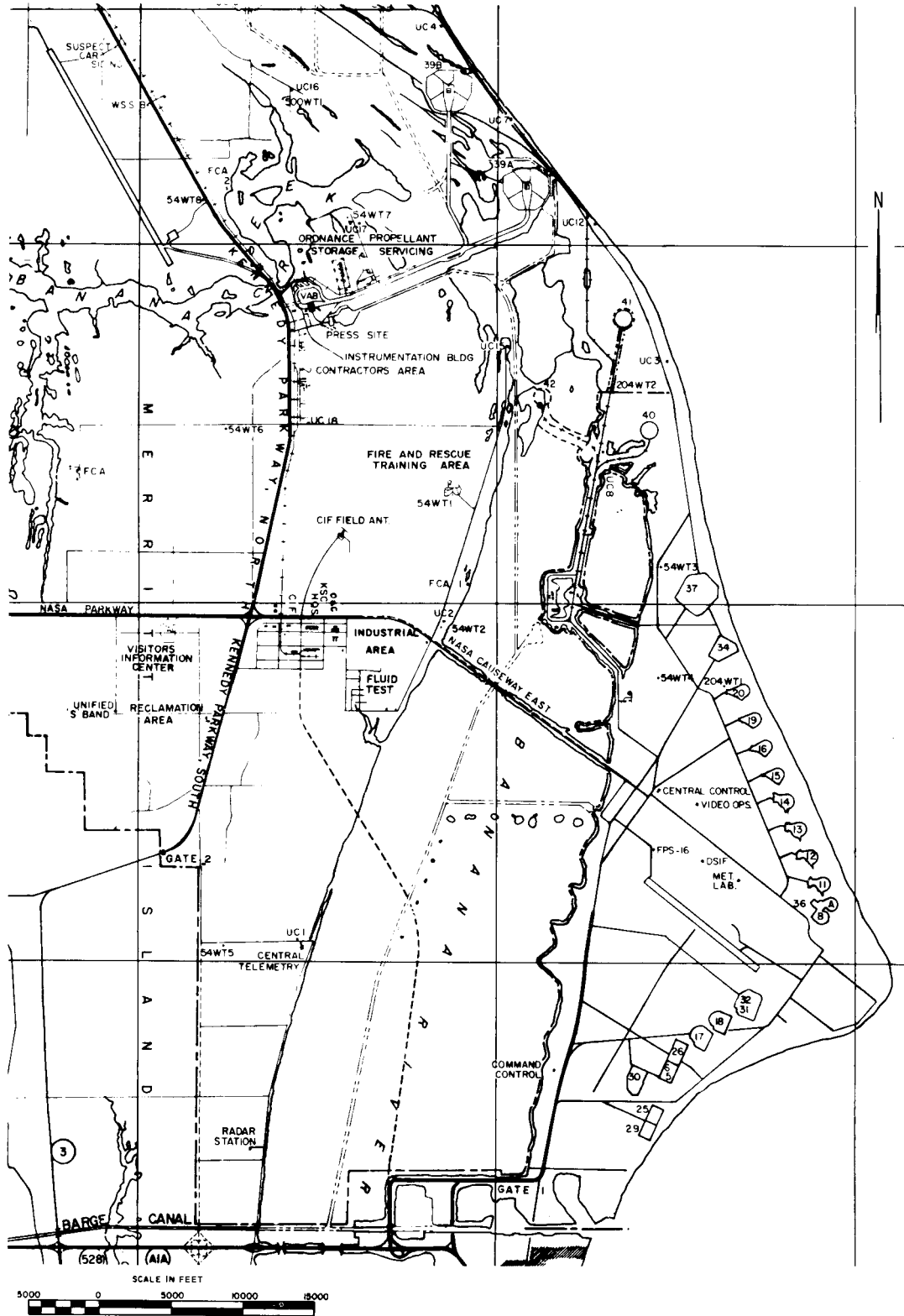
	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	1981 <u>Budget</u> <u>Estimate</u>
b. Environmental health (nine workyears)				301
<p>This category includes industrial hygiene, radiological health, and environmental sanitation. This includes water supply and distribution, sewage treatment and disposal, treatment and disposal of industrial wastes, solid waste management and disposal, selection and use of pesticides, and the surveillance of operations producing atmospheric, water, or soil pollution.</p>				
3. Installation support services.....				6,686
a. Supply services (136 workyears)				3,877
<p>This support contractor effort provides a broad range of logistics services including receipt, storage, and issue of supplies and equipment, as well as maintaining various supply management systems.</p>				
b. Mail (37 workyears)				1,010
<p>Mail and distribution services, provided by support contract, include distribution of inter-office mail, classified document control, operation of the KSC branch post office, and postage.</p>				
c. Office supplies.....				1,209
<p>As an economy measure, KSC provides common support to the total on-site population, civil service and contractor. This category includes a wide variety of office supplies and materials.</p>				
d. Administrative equipment.....				590
<p>This category covers lease, maintenance, and purchase of administrative equipment. Rentals are primarily for special purpose office equipment more economical to lease than purchase. Maintenance is provided for all government-owned administrative equipment in active service. Purchases are largely replacements of office machines such as typewriters and calculators.</p>				

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER



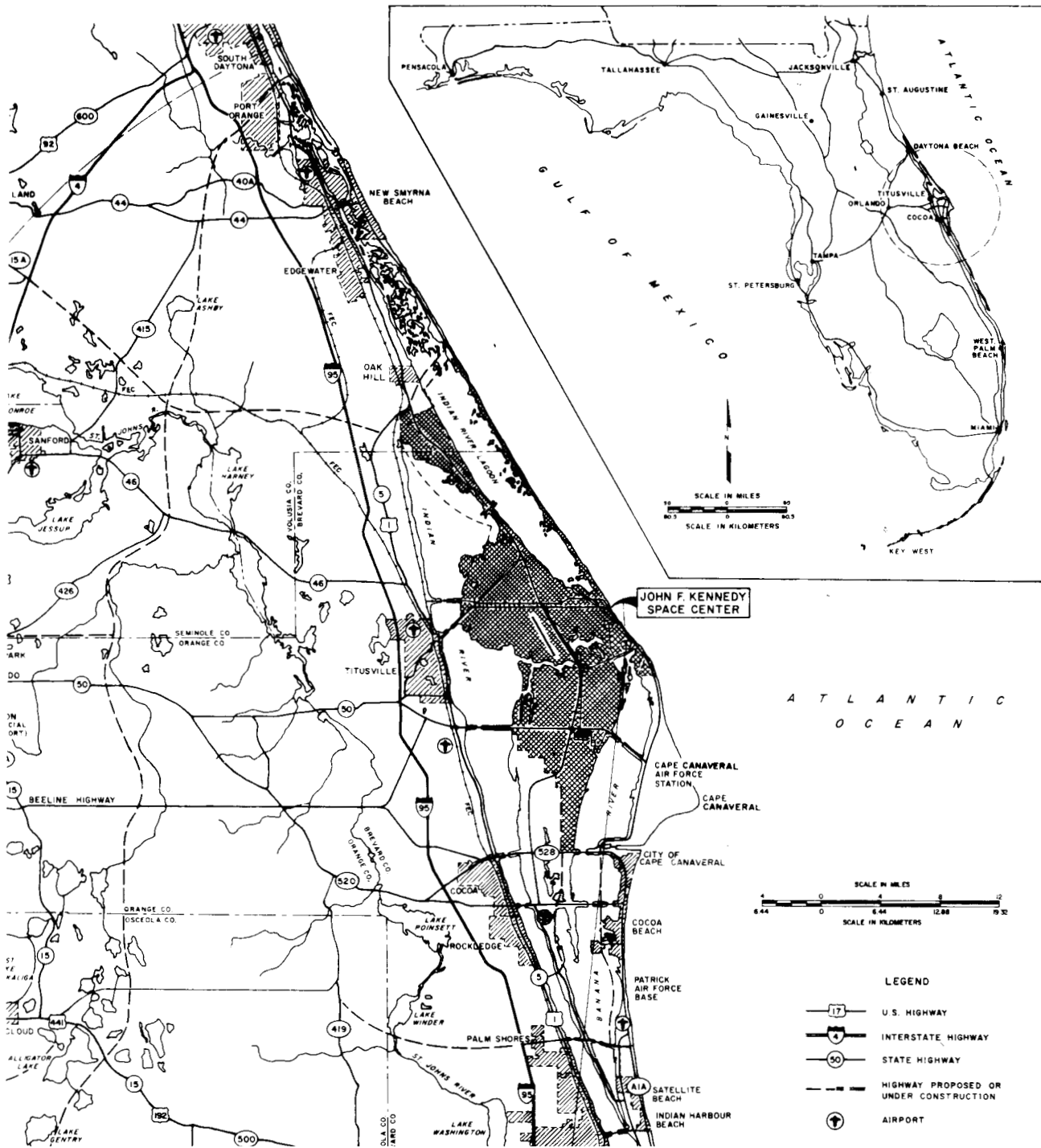
JOHN F. KENNEDY SPACE CENTER, NASA FISCAL YEAR 1981 ESTIMATES LOCATION PLAN

RPM 2-27



JOHN F. KENNEDY SPACE CENTER, NASA FISCAL YEAR 1981 ESTIMATES AREA MAP

RPM 2-28



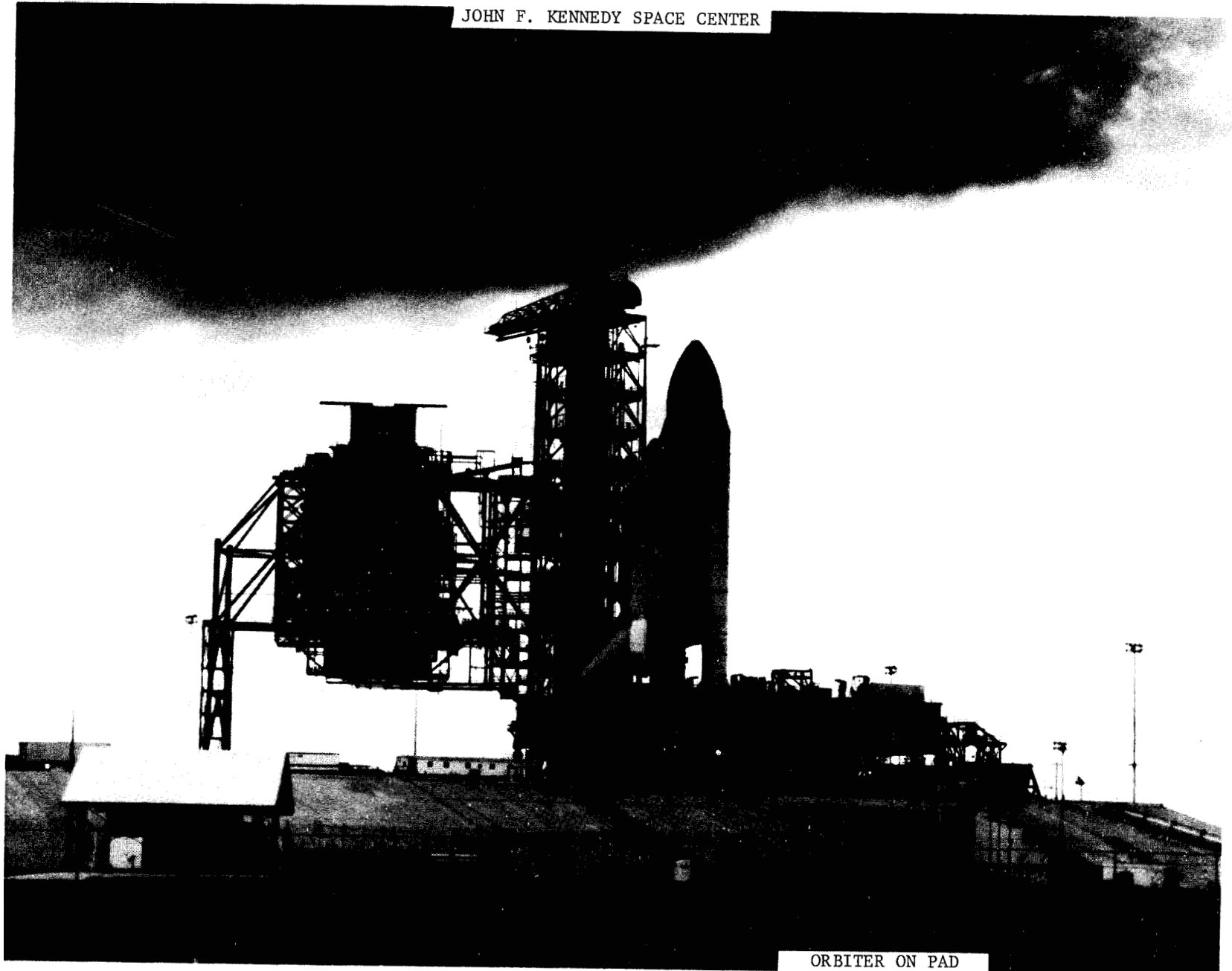
JOHN F. KENNEDY SPACE CENTER



AERIAL VIEW

RPM 2-29

JOHN F. KENNEDY SPACE CENTER

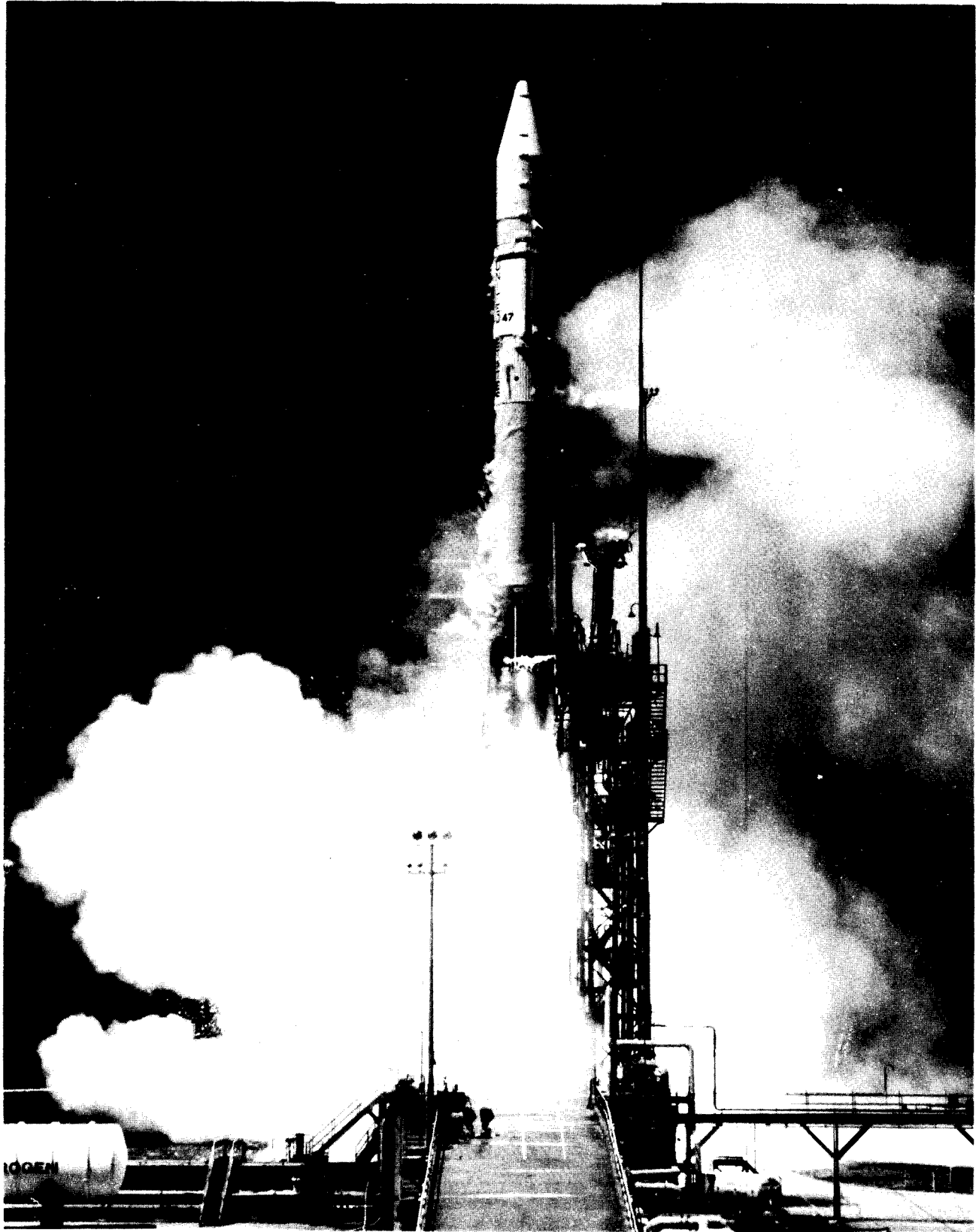


ORBITER ON PAD

JOHN F. KENNEDY SPACE CENTER

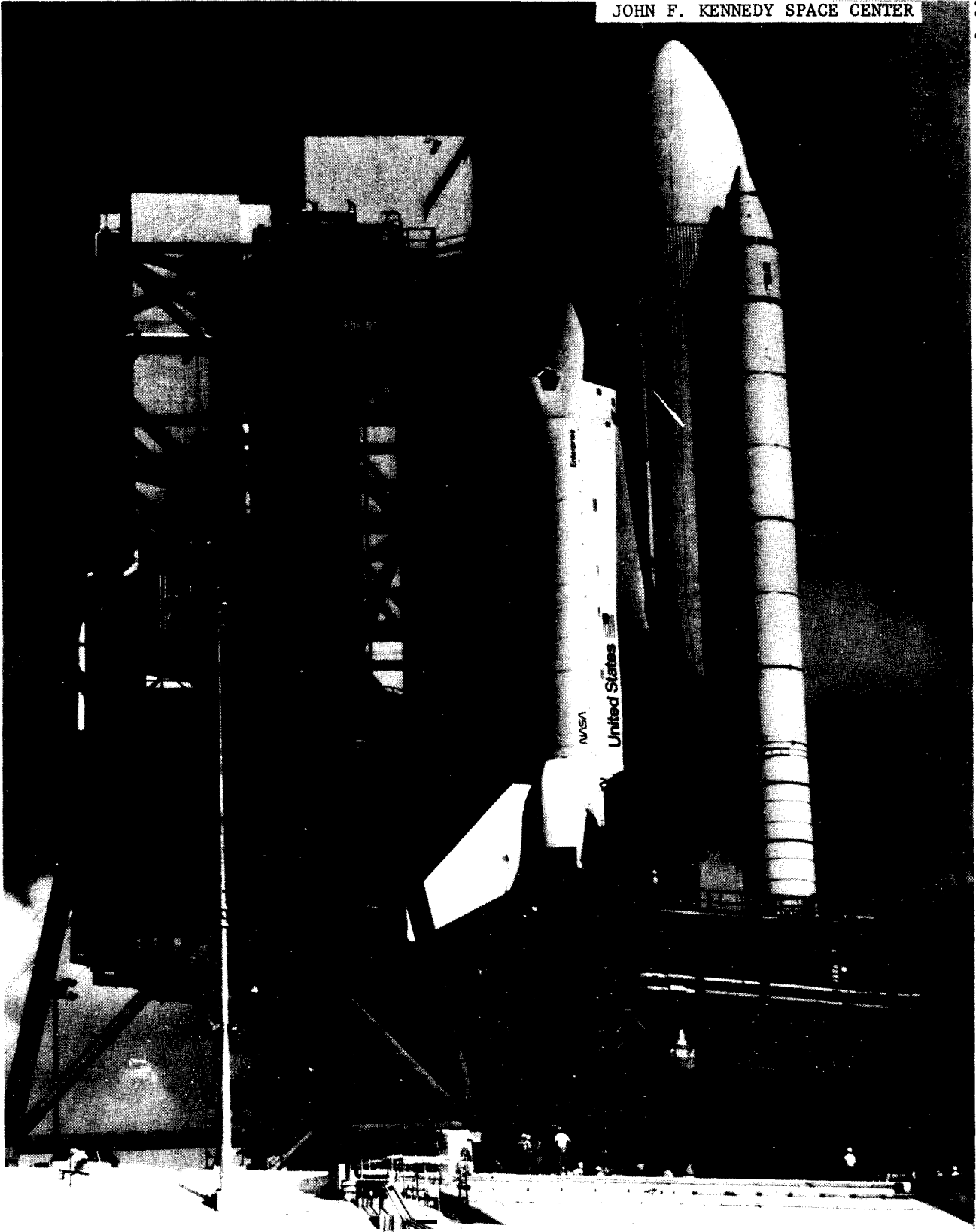


INDUSTRIAL AREA



CENTAUR LAUNCH

JOHN F. KENNEDY SPACE CENTER



RPM 2-33

RSS AND SPACE

MARSHALL SPACE
FLIGHT CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

DESCRIPTION

Operations at the Marshall Space Flight Center (MSFC) are conducted at three primary locations:

The principal MSFC site is near Huntsville, Alabama, on Army property at the Redstone Arsenal. The Center occupies 1,641 acres under a nonrevocable use permit from the Army. Certain facilities such as the Redstone Arsenal Air Field and some utilities are used jointly by NASA and the Army. The Huntsville location is connected by deep water access to its component Michoud Assembly Facility via the Tennessee, Ohio, and Mississippi Rivers.

The Michoud Assembly Facility is located 15 miles east of New Orleans, Louisiana, where the External Tank for the Space Shuttle is being produced and where activities for other Federal agencies are conducted. The Michoud Facility occupies 832 acres and provides 3,563,304 gross square feet of space, including the main assembly plant which has an area of 43 acres under one roof. The facility is located on the Gulf Intracoastal Waterway and has deep water access via the Mississippi River.

The Slidell Computer Complex, located at Slidell, Louisiana, 20 miles northeast of the Michoud Assembly Facility occupies 14 acres and provides centralized computer services for MSFC, Michoud, the National Space Technology Laboratories, other NASA Centers, and associated contractors, as well as other Government agencies.

A number of the individual facilities at MSFC and its component installations are unique. The combined capability of the science and engineering laboratories, special development facilities, and test facilities, provide a unique national resource for the designing, developing, and testing of complex space systems. The total capital investment of the Marshall Space Flight Center and its installations in Louisiana, including fixed assets in progress, and contractor-held facilities at various locations as of September 30, 1979, was \$738,512,000.

CENTER ROLES AND MISSIONS

The Marshall Space Flight Center serves as one of NASA's primary centers for the design and development of space transportation systems, orbital systems, scientific and applications payloads, and other systems for present and future space exploration. MSFC is the principal center within NASA for rocket propulsion systems; for the design and development of manned vehicle systems; for Spacelab mission management and payload definition; for design and development of large, complex, and specialized automated spacecraft; and development of the space processing activity base. MSFC has a primary role within NASA for the development and processing of science and

applications experiments and for the conduct of energy-related system studies. In addition, MSFC conducts a vigorous research and technology program and is involved in the study and definition of future programs, including significant roles contributing to the development of large, complex space structures, space propulsion systems, materials engineering, materials processing in space, power systems, guidance and control, fundamental electronics, and payload systems analysis and integration.

In addition to onsite activities at Huntsville, Alabama, MSFC manages the Michoud Assembly Facility at New Orleans and the Computer Complex at Slidell, Louisiana. Resident offices are maintained at other centers and in conjunction with major industrial sites in various locations throughout the Nation, and in Europe for the Spacelab program. The principal and supporting roles are:

PRINCIPAL

Propulsion Systems - design, development and procurement of major propulsion-oriented systems and subsystems. Current focus is on space transportation systems, including Space Shuttle main engine, solid rocket booster, external tank; and inertial upper stage in cooperation with the Air Force. Advanced program effort includes the solar electric propulsion systems, the heavy lift launch vehicle, and the orbital transfer vehicle.

Manned Space Vehicle Development - design, development and procurement of manned vehicle systems.

Spacelab - focus is on systems engineering management, development interface with the European Space Agency and procurement.

Advanced Studies - focus is on orbital systems, advanced transportation systems and space power systems.

Advanced Development - technology advances focused on the advanced missions identified above.

Space Transportation System (STS) Sustaining Engineering - provide sustaining engineering for MSFC developed STS hardware.

Spacelab Mission Management and Payload Definition - management of Spacelab missions 1, 2, and 3, and definition and development of combinations of payloads, facilities, experiments and instruments for missions as assigned.

Specialized Automated Spacecraft - design and development of large, complex and/or specialized automated spacecraft as assigned. Current focus is on spacecraft systems and experiment integration for Space Telescope, and spacecraft studies of the Advanced X-Ray Astrophysics Facility and the Gravity Probe-B.

Space Processing - develop space processing discipline base, enlisting user interest in potential applications, and developing and managing space processing experiments.

SUPPORTING

Space Vehicle Structures and Materials - contribute to the development of large, complex space vehicle structures and materials technology base.'

Energy Technology - conduct energy-related system studies for reimbursable activity with primary focus on solar heating and cooling and advanced coal extraction technology.

Satellite Power System - conduct definition study activity.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	119,453	119,961	128,051	127,967
II. Travel.....	2,558	2,684	2,604	2,982
III. Facilities Services.....	11,443	12,395	11,825	12,881
IV. Technical Services.....	6,541	5,588	6,287	6,687
V. Management and Operations.....	<u>9,012</u>	<u>8,256</u>	<u>8,832</u>	<u>9,860</u>
Total, fund requirements.....	<u>149,007</u>	<u>148,884</u>	<u>157,599</u>	<u>160,377</u>

Distribution of Permanent Positions by Program

	1979	1980	1981	
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>1.873</u>	<u>1.859</u>	<u>1.842</u>	<u>1.878</u>
Space shuttle.....	1.390	1.171	1.141	985
Space flight operations.....	483	688	701	893
<u>Space Science</u>	<u>509</u>	<u>476</u>	<u>433</u>	<u>451</u>
Physics and astronomy.. ..	509	476	433	451
<u>Space and Terrestrial Applications</u>	<u>390</u>	<u>401</u>	<u>403</u>	<u>328</u>
Space applications.....	379	390	392	317
Technology utilization.....	11	11	11	11
<u>Aeronautics and Space Technology</u>	<u>259</u>	<u>214</u>	<u>289</u>	<u>310</u>
Aeronautical research and technology.....	9	9	7	7
Space research and technology.....	103	94	119	119
Energy technology.....	<u>147</u>	<u>111</u>	<u>163</u>	<u>184</u>
Subtotal. direct positions	3.031	2.950	2.967	2.967
<u>Center Management and Operations Support Positions</u>	<u>605</u>	<u>611</u>	<u>594</u>	<u>594</u>
Total. permanent positions.....	<u>3.636</u>	<u>3.561</u>	<u>3.561</u>	<u>3.561</u>

PROGRAM DESCRIPTION

Permanent Positions (Civil Service)

SPACE SHUTTLE 985

The major MSFC Shuttle element assignments consist of: (1) the Space Shuttle Main Engine (SSME); (2) the Solid Rocket Booster (SRB); (3) the External Tank (ET); (4) planning, preparing and conducting major Shuttle systems tests; and (5) Shuttle system level analysis, test and integration tasks such as: ascent control and stability analysis; flight predictions; structural dynamic analysis and modeling; systems safety and risk analysis; and test, checkout and launch criteria requirements.

In 1981 the major emphasis will be shifting from development and ground testing to flight testing and design refinement. The Space Transportation System flight test (STS-1) is scheduled in 1980 with three additional STS flights scheduled during 1981. Significant effort will be required to provide flight hardware and to evaluate hardware and system performance for these early flights in preparation for the first operations flight (STS-5). Also, MSFC will be involved in production activities regarding the SSME and spares and equipment.

Some current test activities that will continue in 1981 are: (1) main engine system level testing at the National Space Technology Laboratories (NSTL) and at the Santa Susana Facility to provide full power level (FPL) certification and to demonstrate the engine flight life; (2) SSME Control Simulation Laboratory in the Systems Dynamic Laboratory will continue in operation to assist in flight planning and to investigate system failure modes and anomalies which may occur during orbital flight tests (OFT); and (3) Main Propulsion Test (MPT) program at NSTL will continue and the test facility/capability will be maintained to provide backup support to resolve problems which may occur during OFT. SRB refurbishment design and procedures will be verified during OFT to assure meeting the design reuse goals. The ET weight reduction activities will continue. Refinements in design will be pursued to reduce cost per flight, reduce weight, and improve overall Shuttle system performance. Continuing efforts in configuration management, interface control documentation, logistics, and ground operations will require significant effort. Support will be provided to the Air Force for activation of the Western Test Range.

SPACE FLIGHT OPERATIONS 893

The Space Flight Operations program includes Space Transportation System Operations; Space Transportation System Operations Capability Development; Development, Test and Mission Support; and Advanced Programs. The STS Operations Capability Development activity includes three major areas of effort: Spacelab, STS Upper Stages, and Thrust Augmentation. The Civil Service positions in 1981 are required to carry out the following program activities.

RPM 3-5

STS Operations

STS Operations is a major element of Space Flight Operations and starts with flight five (STS-5). During 1981 the activities will include the production and acquisition of hardware for operational flights. Typical functions will be production engineering, manufacturing, sustaining engineering, anomaly resolution, logistics and contract monitoring. The Operations phase will derive benefits from the OFT program efforts such as weight reduction and producibility charged to the Shuttle Design, Development, Test and Evaluation (DDT&E) phase. Also included in the Space Transportation System Operations activity is the Inertial Upper Stage flight hardware production for STS operational flights.

Spacelab

The Spacelab Engineering Model and Flight Unit will complete integration and testing in Europe and be delivered to NASA where integration and operational flow process verification will begin. NASA funded hardware and software activity will also be continued. Manufacturing and testing of the Spacelab Transfer Tunnel are scheduled for completion with delivery during 1981. Final assembly and delivery of Spacelab utility kits are also planned. Buildup, test, verification, integration and launch of the first OFT Pallet will occur as will similar activities for the second OFT Pallet. Activities supporting procurement of additional Spacelab flight hardware will be underway with some hardware deliveries scheduled and experiment installation and integration and checkout will be in process for Spacelab Mission-1.

Planned activities include development of system requirements, and interface definition and control, NASA hardware and software development, and preparation for Spacelab ground and flight verification on a schedule consistent with the milestones for Spacelab operational capability development which includes the first two Spacelab flights. The primary objectives of these flights, are to verify the Spacelab system and subsystems performance capabilities, verify Spacelab/Orbiter and Spacelab/experiment interface compatibility and to determine the Spacelab induced environment.

STS Upper Stages (Inertial Upper Stage - IUS)

MSFC is responsible for the IUS definition and control of the NASA and non-DOD requirements and for providing these to the Space and Missile Systems Organization (SAMSO) for incorporation into the IUS system development. In addition, MSFC, participating with SAMSO, will provide the management and technical evaluation of the IUS development contractor's design, development and test efforts to assure that the NASA-unique and non-DOD user requirements are incorporated.

The NASA-unique Inertial Upper Stage (IUS) development activities will continue and include completion of software design, integration and verification; spin motor qualification; vehicle and airborne support equipment detail design; and critical design review. Development of selected performance improvement options will continue. The first NASA two-stage vehicle is scheduled for delivery and launch, and the Twin/Spin production activities will continue for the first planetary mission scheduled in early 1983.

Thrust Augmentation

Study activities will continue to augment the payload capability of the basic Shuttle vehicle. Major activities will include development of detailed impacts of the selected liquid boost module concept and preliminary system design. Thrust Augmentation capability is scheduled to be available in mid-1985.

Advanced Programs

The Advanced Programs effort at MSFC includes the definition and implementation of in-house and contracted systems studies to establish the fundamental planning and decisionmaking data needed for the evaluation of future space program proposals. Major 1981 advanced studies activities include: 25KW Power System, Tether Satellite, Solar Electric Propulsion System (SEPS), fabrication of structural elements in space; studies of improved propulsion systems capable of using different propellants in the same system; continue concept studies of geostationary platforms and materials experimentation carriers/modules; and studies of advanced manipulator systems, remote controls, visual aids and sensory systems to augment the ability of humans to function efficiently in space.

Permanent Positions
(Civil Service)

PHYSICS AND ASTRONOMY..... 451

The Center provides leadership in the Agency's Space Science program for the High Energy Astronomy Observatory (HEAO), Space Telescope, and Spacelab Payload Missions 1 and 2; and provides supporting research and technology support to identify the new technologies required for future missions.

High Energy Astronomy Observatory (HEAO)

The High Energy Astronomy Observatory (HEAO) program is a series of three, large unmanned observatories developed under the direction of MSFC for performing scientific investigations in high energy astronomy. The principal efforts will be completing the HEAO-3 mission and conducting the HEAO-2 mission operations. Data reduction and analysis of all three missions will also be underway during this period, along with management of the HEAO Guest Investigator program. The extended HEAO program will also be underway, involving analysis of data from the extended HEAO-1 mission, and planning and accomplishment of HEAO-2 and HEAO-3 extension.

Chemical Release Module

The Chemical Release Module (CRM) is a Spacelab Facility which will be used to conduct investigations in atmospheric and space physics. The development contract is scheduled to be awarded in 1980, with the design, development, testing and evaluation being conducted during 1981.

Space Telescope

The objective of the Space Telescope (ST) project is to orbit a high optical quality 2.4-meter telescope system by the Space Shuttle in 1983 for use by the astronomical community in conjunction with NASA. MSFC is the lead center for the management of the Space Telescope project and has overall implementation responsibility to OSS for meeting cost, schedule, and technical performance of the project. MSFC is responsible for directing all NASA and contractors' efforts, for establishing and maintaining effective project management activities, and for preparing and maintaining the detailed technical specifications which will define the requirements for all elements of the project. This includes the technical assessment and evaluation of contracted activities for system engineering, design and development, and assembly and verification. In 1981, fabrication, assembly, and verification testing will proceed on all hardware elements of the ST program. During 1981, the Critical Design Review (CDR) to assure that the detail design is in accordance with the specifications, will be accomplished for the Support Systems Module.

Spacelab Payload Mission Management

MSFC is the lead center for the management and implementation of Spacelab Missions 1, 2, 3, OSTA-2, and Material Processing Pallet Mission, which begins with the definition and recommendation of the payload complement and ends with the dissemination of flight/mission-related data and materials required for experiment analysis and processing. During 1981, MSFC will continue to manage development of the experiment complements of Spacelab Missions 1 and 2. Supporting mission-peculiar hardware and software will be delivered for the Level IV integration of the mission experiments beginning in 1981. During 1981, interfaces will continue to be maintained with the NASA discipline program offices, the Principal Investigators, and appropriate engineering groups to assure that the scientific objectives of the missions are achieved. MSFC will continue to participate in and manage the analysis of the requirements, objectives, characteristics, and constraints of several systems, subsystems, and hardware/software components of the STS, payload carrying equipment and payload components, so as to define and develop requirements for all levels of integration to insure physical, functional, and operational compatibility for all missions.

Research and Analysis

Research and technology activities at MSFC are oriented toward developing technologies required for future science missions. The principal science areas are astrophysics and solar physics. In 1981, study efforts for the Gravity Probe-B (GP-B) and an Advanced X-Ray Astrophysics Facility will be continued.

Pennant Positions
(Civil Service)

SPACE APPLICATIONS.....

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The civil service complement requested for this line item will be involved in three major space applications assignments: (1) Atmospheric Cloud Physics Laboratory, (2) Materials Processing in Space, and (3) Supporting Research.

Atmospheric Cloud Physics Laboratory

Atmospheric Cloud Physics Laboratory (ACPL), under MSFC's management direction, will be flown first as a partial payload of Spacelab to provide the scientific community a unique multipurpose laboratory facility for conducting experimental atmospheric cloud physics research in a low-gravity environment. During 1981 development testing of the flight unit will be accomplished, payload specialist training will be conducted and the first flight Principal Investigators (PI's) will conduct experiment testing to check out procedures, timelines and experiment-to-laboratory compatibility. Subsequently, hardware update or refurbishment of the flight unit will be accomplished for utilization as a qualification unit and qualification testing will be completed in preparation for delivery to the Kennedy Space Center. Systems engineering and integration will enter a critical phase to assure proper design, engineering, and scientific relationships among the areas of Spacelab-to-ACPL, man-machine constraints, and overall performance capability.

Materials Processing in Space

The Materials Processing in Space program emphasizes the fundamental science and technology of processing materials under conditions that allow detailed examination of the constraints imposed by gravitational forces. These studies are directed towards selected materials and processes which will best identify the limitations due to gravity as well as demonstrate the enhanced control that may be possible by the weightless environment of space. In 1981, the Materials Processing in Space program at MSFC will include four major elements: (1) crystal growth and solidification, (2) containerless processing, (3) fluid and chemical processing, and (4) commercialization studies. Expansion of the program to include a wider base of investigations using existing hardware is being planned for the latter part of the five-year period, 1980-84, based on the outcome of prior research activities. The activities include ground-based research, engineering and scientific analyses, advanced studies, and technical management of definition, design, development, and operation of material processing experiments, apparatus, and payloads.

Supporting Research

Theoretical and experimental research will be done in the area of severe storms and local weather. Efforts will be concentrated on the analysis of applications programs including weather and climate, communications, and earthquake hazards reduction.

Permanent Positions
(Civil Service)

TECHNOLOGY UTILIZATION.....

11

The Technology Utilization program transfers new knowledge and innovative technology resulting from NASA's Research and Development programs for application in industry, medicine, and public sector areas. MSFC civil service engineering and science personnel provide the primary source of technical skills necessary to accomplish the technology transfer to the public sectors.

AERONAUTICAL RESEARCH AND TECHNOLOGY

The Aeronautical Research and Technology effort is concerned with aircraft operational safety. The major activities in 1981 will be to continue studies of turbulence over the surface of an aircraft wing, to perform gust correlations, to investigate the dissipation of fog, and to continue development of a Clear Air Turbulence (CAT) detection system. Analysis of data from field tests of the CAT detection system will be accomplished in 1981. Atmospheric flow systems will be measured remotely by using infrared lasers.

SPACE RESEARCH AND TECHNOLOGY

119

The major Space Research and Technology discipline efforts at Marshall are in materials, structures, dynamics, high density circuit technology, guidance and control, data processing technology, large solar array technology, electronic systems technology, and cryophysics and propulsion. In 1981, these efforts will focus on developing technology for high performance propulsion power systems and large space systems for the future.

Also in this area is the Standards and Practices program which provides for development of equipment for multi-mission applications and business practices to effect cost savings and for improvements in current and future space programs. In 1981, civil service personnel will continue to manage the development of those projects selected by the Standard Equipment Review Panels.

Also included in this area is the Shuttle/Spacelab Payloads effort concerned primarily with the Induced Environmental Contamination Monitor (IECM), and Tribological Experiments. All of these areas will have continuing emphasis throughout 1981.

ENERGY TECHNOLOGY.....

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MSFC activities include energy studies, development of a guidance and control system for coal extraction, development tasks and commercial and Federal buildings applications tasks in support of the national program for Solar Heating and Cooling.

Energy Studies

Energy from space encompasses definition studies in two areas: satellite power systems and nuclear waste management. Activities in 1981 will include the identification of system/subsystem requirements, development

of conceptual designs and operational scenarios, development and impact of technology requirements, concept evaluations and selections and economic cost model development.

Automated Coal Extraction

The Department of Energy has overall responsibility for developing an automated longwall guidance and control shearer mining system which will improve productivity and enhance health and safety of the miners. MSFC is working with the Department of Energy to develop a prototype automated Longwall Guidance and Control System. Activities will include program and contract management, design, fabrication, test of experimental sensors and controls, data evaluation and system analysis.

Solar Heating and Cooling

MSFC is responsible for supporting three major programs of the overall national program for Solar Heating and Cooling: (1) the "Development in Support of Demonstration program," (2) the "Commercial Demonstration program," and (3) the "Demonstration of Solar Heating and Cooling in Federal Buildings program." The purpose of the Development in Support of Demonstration program is to use present technology and technology emerging from the national research and technology program to bring solar heating and cooling systems and subsystems to the point where they will be tested and ready for use in residential and commercial applications. The Commercial Demonstration Program is organized to encourage the use of solar energy in commercial applications and to recommend and develop new ways to eliminate constraints against wide-spread acceptance. The Federal Building program is designed to stimulate growth and improve the efficiency of the solar industry by demonstrating Federal Government confidence in and support of the industry.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT 594

Center Management and Operations Support is defined as that support or service being provided to all Marshall Space Flight Center organizations which cannot be directly identified to a benefiting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and immediate staff, e.g., Comptroller, Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget analysis, program control, contracting and procurement, personnel management, property management, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:.

Maintenance and operation of all buildings and facilities
 Data processing and computer support
 Reliability and quality assurance
 Center-wide security and protection
 Fire protection
 Custodial services
 Logistics support including transportation, supplies
 Medical care of employees
 Photographic and graphic support
Energy management

RESOURCE REQUIREMENTS BY FUNCTION

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1981 <u>Budget Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS.</u>	<u>119.453</u>	<u>119.961</u>	<u>128.051</u>	<u>127.967</u>

Summary of Fund Requirements

A. Compensation and Benefits

1. Compensation

●● Permanent positions.....	105,715	105,945	113,009	112,755
b. Other than full time permanent positions.....	1,113	1,388	1,364	1,407
■■ Reimbursable detailees.....	83	69	36	33
d. Overtime and other compensation.....	<u>1,071</u>	<u>870</u>	<u>1,093</u>	<u>1,136</u>
Subtotal, Compensation.....	107,982	108,272	115,502	115,331

	1979 <u>Actual</u>	<u>1980</u>		<u>1981</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
2. <u>Benefits</u>	10,111	11,121	11,849	11,900
Subtotal, Compensation and Benefits.....	118,875	119,393	127,351	127,231

B. Supporting Costs

1. Transfer of personnel.....	184	246	246	246
2. Personnel training.....	394	322	454	490
Subtotal, Supporting Costs.....	578	568	700	736
Total, Personnel and Related Costs.....	119,453	119,961	128,051	127,967

Explanation of Fund Requirements

A. <u>Compensation and Benefits</u>	118,875	119,393	127,351	127,231
1. <u>Compensation</u>	107,982	108,272	115,502	115,331
a. <u>Permanent positions</u>	105,715	105,945	113,009	112,755

The funds shown above will support 3,561 permanent positions in 1981. The increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the October 1979 pay increase. The decrease in 1981 from 1980 is due to one less workday and a reduction in workyears offset by a decrease in reimbursable activity.

Basis of Cost for Permanent Positions

In 1981 the cost of permanent positions will be \$112,755,000, an increase of \$254,000 over 1980. This decrease is calculated as follows:

Cost of permanent positions in 1980.....	113,009
Cost increase in 1981.....	+2,392

Within grade and career advances:

Full year effect of 1980 actions.....	+679	
Partial year effect of 1981 actions.....	+673	
Full year effect of 1980 pay increases.....	+143	
Decrease in reimbursable activity.....	+897	
Cost decrease in 1981.....		-2,646
Turnover savings and abolished positions:		
Full year effect of 1980 actions.....	-1,744	
Partial year effect of 1981 actions.....	-515	
One less paid day.....	-387	
Cost of permanent positions in 1981.....		<u>112,755</u>

	1979	1980		1981
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		

U. Other than full-time permanent positions

1. Cost.....	1,113	1,388	1,364	1,407
2. Workyears.....	108	130	160	165

The increase in workyears in the 1980 current estimate and the 1981 estimate reflect the new White House Research Apprenticeships program. The decrease in cost from the 1980 budget estimate to the 1980 current estimate is due to a change in skill mix. The increase of the 1981 estimate is due to the increase in the White House Research Apprenticeships program.

The 1981 estimate includes 165 workyears which will be used to support the following programs:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Co operative training.....	64
Summer employment.....	24
Opportunity programs.....	56
Other temporary employment.....	<u>21</u>
Total.....	<u>165</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
.. Reimbursable detailees.....	83	69	36	33

Reimbursable detailees have been assigned to NASA from DOD to support the Center in the field of solid rocket motors and in the use of the Neutral Buoyancy Simulator. The simulator is used in the development of operational procedures and the evaluation of design concepts to assure flight hardware will function in space (effort supports development, design, instrumentation, and engineering techniques for Spacelab Transfer Tunnel, STS Power Module, Shuttle Payload Bay and Solar Array Systems). This effort provides mutual benefits to NASA and DOD by providing NASA with special talents and by keeping DOD personnel current on manned space flight technology. The decreased cost in 1980 from the budget estimate to current estimate is due to the release of four Navy divers supporting the Neutral Buoyancy Simulator activity. Only a minimum level of support will be required in 1981 as continuing requirements will be supported by trained NASA divers.

d. Overtime and other compensation.....	1,071	870	1,093	1,136
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The 1980 current estimate has increased from the 1980 budget estimate due to the effect of the October 1979 pay increase, increased overtime due to reduced civil service manpower levels, and a continuation of the Spacelab resident office personnel in support of the European Space Agency.

2. <u>Benefits</u>	<u>10,893</u>	<u>11,121</u>	<u>11,849</u>	<u>11,900</u>
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The distribution of these costs by major categories is as follows:

Civil Service Retirement Fund.....	7,397	7,361	7,903	7,876
Employee life insurance.....	334	476	497	493
Employee health in	2,093	2,158	2,246	2,243
Workman's compensation.....	1,032	1,075	1,059	1,191
FICA.....	36	51	51	51
Severance pay.....	<u>1</u>	<u>---</u>	<u>93</u>	<u>46</u>
Total.....	<u>10,893</u>	<u>11,121</u>	<u>11,849</u>	<u>11,900</u>

The increases in 1980 are primarily due to the October 1979 pay increase. The 1981 increases are due to reduced reimbursable activity offset by one less paid day. Workman's compensation costs are based on the Department of Labor billings for 1980 and 1981.

	1979 <u>Actual</u>	<u>1980</u>		1981 <u>Budget</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
B. <u>Supporting Costs</u>	<u>578</u>	<u>568</u>	<u>700</u>	<u>736</u>
1. Transfer of personnel.....	184	246	246	246

The estimated costs provide for certain relocation costs, such as the expenses of selling and buying a home and the movement of household goods.

2. Personnel ing	394	322	454	490
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The purpose of the MSFC training program is to continue the development of skills and knowledge of civil service employees in order to more efficiently support MSFC's roles and missions. The benefits to be derived by NASA, from the training and educational programs conducted at MSFC, include: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency within the administrative and clerical work force; development of needed skills and knowledge required in MSFC mission activities; and extending MSFC work force capability and increasing productivity. The increase in the 1980 current estimate over the 1980 budget estimate reflects the operating level necessary to support on-going programs and the training requirements for the implementation of the Civil Service Reform Act. The 1981 estimate assumes a training program at approximately the 1980 level.

II. <u>TRAVEL</u>	<u>2,558</u>	<u>2,684</u>	<u>2,604</u>	<u>2,982</u>
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Summary of Fund Requirements

A. Program Travel.....	2,390	2,463	2,407	2,768
B. Scientific and Technical Development ed	40	28	32	35
C. Management and Operations set	<u>128</u>	<u>193</u>	<u>165</u>	<u>179</u>
Total, Travel.....	<u>2,558</u>	<u>2,684</u>	<u>2,604</u>	<u>2,982</u>

Explanation of Fund Requirements

	<u>1979</u> <u>Actual</u>	<u>1980</u> <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>1981</u> <u>Budget</u> <u>Estimate</u>
A. <u>Program Travel</u>	<u>2,390</u>	<u>2,463</u>	<u>2,407</u>	<u>2,768</u>

Program travel is directly related to the accomplishment of the Center's mission and is approximately 93 percent of the total MSFC travel. Travel requirements are for on-going programs such as the Space Shuttle Main Engine, External Tank and Solid Rocket Booster, STS Operations, Spacelab, Inertial Upper Stage, Space Telescope, Space Science and Applications Payloads and basic and supporting research and technology. Travel for Spacelab, Spacelab Payloads, and Space Telescope will require both domestic and European travel. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The increase in 1981 is required to support program milestones.

B. <u>Scientific and Technical Development Travel</u>	<u>40</u>	<u>28</u>	<u>32</u>	<u>35</u>
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Scientific and technical development travel permits employees to participate in meetings and technical seminars with representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside MSFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve problems for the benefit of the Government.

C. <u>Management and Operations Travel</u>	<u>128</u>	<u>193</u>	<u>165</u>	<u>179</u>
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Management and operations travel is required for the direction and coordination of general management matters. It includes travel by managers in such areas as personnel, financial management, and procurement activities and travel of the Center's top management to NASA Headquarters, other NASA Centers, and local transportation. The decrease from 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The 1981 estimate ~~reflects essentially the same~~ level of travel activity as in 1980.

III. <u>FACILITIES SERVICES</u>	<u>11,443</u>	<u>12,395</u>	<u>11,825</u>	<u>12,881</u>
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The Marshall Space Flight Center (MSFC) occupies 1,841 acres under Department of the Army permit in a complex of science and engineering laboratories and special development and test facilities.

The complex encompasses 3,654,923 gross square feet of building space including 18 major buildings. Also included are 17 major technical facilities. This physical plant houses an average daily on-Center population of approximately 4,500 personnel. Many of the test facilities are utilized on more than one shift or during off-peak hours.

Summary of Fund Requirements

	<u>1979</u> <u>Actual</u>	<u>1980</u> <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>1980</u> <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>1981</u> <u>Budget</u> <u>Estimate</u>
A. <u>Maintenance and Related Services</u>				
1. Facilities	2,480	2,190	2,271	2,827
2. Equipment	320	182	368	394
Subtotal	<u>2,800</u>	<u>2,372</u>	<u>2,639</u>	<u>3,221</u>
B. <u>Custodial Services</u>	<u>2,702</u>	<u>3,077</u>	<u>2,418</u>	<u>3,119</u>
C. <u>Utilities Services</u>	<u>5,941</u>	<u>6,946</u>	<u>6,768</u>	<u>6,541</u>
Total, Facilities Services	<u>11,443</u>	<u>12,395</u>	<u>11,825</u>	<u>12,881</u>

Explanation of Fund Requirements

A. <u>Maintenance and Related Services</u>	<u>2,800</u>	<u>2,372</u>	<u>2,639</u>	<u>3,221</u>
1. Facilities	2,480	2,190	2,271	2,827

This activity involves a total of 237 facilities (buildings, structures, and trailers) with 3.7 million square feet of floor area. Also involved are 1,841 acres of land area, onemillionsquare yards of surfaced area, and several special structures and systems. The funding for 1981 reflects requirements for repair and alteration projects, such as relocating shop areas to reduce heating requirements, installing a two and one-half ton Rankin Solar System to reduce energy requirements, and interior painting which were deferred from 1980.

a. Maintenance of buildings and grounds	2,421
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The estimate includes 41 workyears of support contractor effort for maintenance and reimbursements to the Army (Redstone Arsenal) for facility maintenance and related services for such items as electrical distribution lines, arterial roads, grounds related to MSFC, and use of Army facilities.

1979 <u>Actual</u>	1980		1981
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
	(Thousands of Dollars)		

b. Supplies and materials..... 406

This estimate provides for the acquisition of building materials, electrical materials, electronic materials, general maintenance materials, general operating materials, general service materials, metals, guages, pipes, valves, and fittings.

2. Equipment 320 182 368 394

This activity includes 13 workyears of support contractor effort and involves maintenance and repair of over 3,900 items of equipment at MSFC. The 1980 budget estimate was optimistic and planned for a reduction in support contractor effort. Based on 1979 experience and aging inventory of equipment requiring increased maintenance, the 1980 current estimate reflects the 1979 level plus three additional workyears necessary to support minimum essential requirements. The 1981 increase assumes the same level of support activity.

B. Custodial Services 2,702 3,077 2,418 3,119

Custodial services includes janitorial services, security services, fire protection, trash removal, sanitary landfill operations, pest control activities, and related supplies and materials. The decrease in 1980 current estimate from the 1980 budget estimate reflects some rephasing of support contract funding plans as well as a lower level of support contractor efforts and associated materials. The 1981 estimate reflects full funding of essentially the same level of services as in 1980.

1. Janitorial services 1,559

This activity provides service to about three million square feet of facility space and trash removal from approximately 125 separate locations. Work is performed principally through a support contractor with a level of effort of 106 workyears.

2. Security and fire protection. 1,532

Services are provided by a support contractor with a level of effort of 38 workyears and through the Army (Redstone Arsenal). Included are 24-hour security coverage of MSFC property, law enforcement, motor vehicle control and registration, as well as fire protection.

3. Minor requirements 28

Services are related to landfill operations and "as needed" pest control. RFM 3-19

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Utilities Services</u>	<u>5,941</u>	<u>6,946</u>	<u>6,768</u>	<u>6,541</u>

The Army (Redstone Arsenal) provides electricity, steam, water, and sewage disposal services to MSFC on a reimbursable basis, and the estimates, therefore, are included in this activity. Also provides for propane and burner fuel for generating steam for environmental heating and cooling. The decrease in the 1980 current estimate and 1981 provides for increased utility rates offset by reduced consumption. The cost of purchased commodities is shown in the following table:

1. Electricity (109,000 mW/Hrs.).....	4,125
2. Propane (12,000 gals.)....	5
3. Fuel oil (544,000 gals.)	260
4. Steam (219,400 K/lbs.).....	1,525
5. Water and sewage.....	605

IV. <u>TECHNICAL SERVICES</u>	<u>6,541</u>	<u>5,588</u>	<u>6,287</u>	<u>6,687</u>
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Summary of Fund Requirements

A. Automatic Data Processing

1. Equipment.....	884	812	852	912
2. Operations.....	<u>3,371</u>	<u>2,706</u>	<u>3,143</u>	<u>3,275</u>
Subtotal.....	<u>4,255</u>	<u>3,518</u>	<u>3,995</u>	<u>4,187</u>

B. Scientific and Technical Information

1. Library.....	722	720	770	822
2. Education and Information.....	<u>121</u>	<u>142</u>	<u>142</u>	<u>155</u>
Subtotal.....	<u>843</u>	<u>862</u>	<u>912</u>	<u>977</u>

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	1981 <u>Budget Estimate</u>
C. <u>Shop Support and Services</u>	<u>1,443</u>	<u>1,208</u>	<u>1,380</u>	<u>1,523</u>
Total, Technical Services	<u>6,541</u>	<u>5,588</u>	<u>6,287</u>	<u>6,687</u>

Explanation of Fund Requirements

A. <u>Automatic Data Processing</u>	<u>4,255</u>	<u>3,518</u>	<u>3,995</u>	<u>4,187</u>
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Provides centralized systems analysis, programming, operations, and related computational services to meet the management and administrative computing requirements. Also includes maintenance of ADP equipment and related supplies and materials. Included are 133 workyears of support contractor effort.

1. Equipment	884	812	852	912
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Maintenance is provided under separate contracts for central site computers and associated equipment. Equipment maintained includes two large Univac 1108 systems, CalComp Disc secondary storage system for the Univac 1108 system, and a key-to-disc which collects, controls, organizes, and edits raw data for input into the Univac 1108 system. The increase from the 1980 budget estimate to the 1980 current estimate is based on actual maintenance cost experience since the 1980 budget estimate was submitted. These contractual services are being maintained at approximately the current level of effort in 1981.

2. Operations	3,371	2,706	3,143	3,275
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This function provides for the development and utilization of computer techniques and systems programming of all digital computers and associated equipment at MSFC. The computer systems include the two large Univac 1108 systems, seven Univac 9300 Remote Job Entry terminals, one IBM 1401, and two FR-80 Electronic plotters. Also included is associated auxiliary support equipment such as film processors, Xerox microfiche printers, Xerox forms copiers, and punch card accounting machines (PCAM). Also included are the operation of two large magnetic tape libraries containing a combined total of 60,000 reels; receipt, control, and distribution of program and data processing products; and testing and cleaning of magnetic tapes.

Also included in the operation costs are program design and development, and development of data base management, configuration management, and accounting software systems. Support is also provided for developing engineering drawings and parts management systems. The increased cost from the 1980 budget estimate to the 1980 current estimate is due to renegotiated labor rates.

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u>	1981 <u>Budget</u> <u>Estimate</u>
B. <u>Scientific and Technical Information</u>	<u>843</u>	<u>862</u>	<u>912</u>	<u>977</u>

This activity provides for the operation of the Redstone Scientific Information Center library at MSFC and support to the Center in various scientific and technical information services.

1. Library.....	722	720	770	822
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Scientific information and library services are provided to MSFC employees and associated contractor personnel through the Redstone Scientific Information Center (RSIC) operations. The RSIC contains a central collection of 234,000 books and journals, 3,000 periodicals, 1,000,000 documents on microfilm and 400,000 technical papers. Operation of the RSIC by the Army is under direction of a joint MSFC/Army Redstone Scientific Information Board with costs shared. The 1981 costs reflect the 1980 current level of effort.

2. Education and information.....	121	142	142	155
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The funds provide for the preparation of reproducible pages for publication of technical manuscripts and related documents. The annual volume of work under this contract is an estimated 12 thousand manuscript pages. Also included is MSFC's share of the operation of the MSFC Visitor Information Center located at the Alabama Space and Rocket Center. The increase from the 1980 current estimate to the 1981 budget estimate is due to increased costs of technical publication services.

C. <u>Shop Support and Service</u>	<u>1,443</u>	<u>1,208</u>	<u>1,380</u>	<u>1,523</u>
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Forty-one workyears of support contractor effort provide the Center with support in the areas of graphics, models and design, construction, and management of exhibits. Related supplies, materials, and equipment are also included in this activity. Graphic materials are prepared for use in such presentations as senior management meetings. The increase from the 1980 budget estimate to the 1980 current estimate is due to a higher level of program activity than planned. The increase in the 1981 estimate is due primarily to an increase in support contractor effort and increased cost of supplies and materials.

1. Instrumentation support.....				24
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This category provides funds for gauge calibration services work procured from the Army (Redstone Arsenal). Included are microwave, radio frequency, and optical and acoustic instrumentation calibration.

	<u>1979</u> <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u>		<u>1981</u> Budget <u>Estimate</u>
		(Thousands of Dollars)		
2. Photographic services.....				460
Consists of procurement of off-site commercial still photographic and motion picture production services. Also includes operation of the film library. Still photographic services include printing and processing of color and black and white prints, slides, vugraphs, and copy camera photography. Motion picture production services include script writing, film editing, sound recording, and printing and processing of sound motion pictures. Approximately 138,000 still photo units and 240,000 feet of motion picture service are required annually.				
3. Graphics.....				1,039
Forty-one workyears of support contractor effort is required for the preparation of charts, graphs, vugraphs and similar visuals for administrative and operational requirements are included in this activity. Approximately 35,000 work units are completed annually. Also includes the design, construction, and management of exhibits in connection with MSFC's Public Affairs activity.				
<hr/>				
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>9,012</u>	<u>8,256</u>	<u>8,832</u>	<u>9,860</u>
<u>Summary of Fund Requirements</u>				
A. Administrative Communications.....	2,639	2,603	2,912	3,131
B. Printing and Reproduction.....	559	487	584	615
C. Transportation	2,639	2,325	2,114	2,638
D. Installation Common Services.....	<u>3,175</u>	<u>2,841</u>	<u>3,222</u>	<u>3,476</u>
Total, Management and Operations.....	<u>9,012</u>	<u>8,256</u>	<u>8,832</u>	<u>9,860</u>

Explanation of Fund Requirements

	1979 <u>Actual</u>	1980		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
A <u>Administrative Communications.....</u>	<u>2,639</u>	<u>2,603</u>	<u>2,912</u>	<u>3,131</u>

Communications support for MSFC, which includes 27 workyears of support contractor effort, consists of local telephone service, long distance telephone service, and various kinds of other nontelephone communications. Costs in local telephone service in 1979 were higher than anticipated due to large rate increases and these increases are reflected in the 1980 current estimate. The increase in 1981 is primarily for the Federal Telecommunications Service (FTS) telephone network.

1. Local telephone service..... 1,607

The MSFC Central Exchange provides instruments and lines at the Center for local telephone service. The increase in 1981 is for escalation of telephone rates and support contractor wage rate increases.

2. Long distance telephone service..... 1,072

Provides for MSFC use of the GSA operated long distance (FTS) telephone network. Costs result from a formula which is based primarily on the number of calls made two years in the past and the number of circuits used by the Center. Included are such items as long distance commercial tolls and the Autodin network for ordering supplies and materials and sending and receiving classified information. Also included are the costs of leased lines for the teleconferencing network and two workyears of support contractor effort

3. Other communication services..... 452

These funds provide for use of Weeden Mountain radio transmission facilities, support of the Emergency Warning System, and operation of MSFC's Fire Surveillance System. Also provided are payments for entry into the GSA teletype system for Government subscribers, entry into the Western Union teletype system for commercial subscribers, and overseas telegrams and cable system upkeep. Seven workyears of contractor effort are required to support these activities and the administration and management of telecommunication services.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
B. Printing and Reproduction	<u>559</u>	<u>487</u>	<u>584</u>	<u>615</u>

A portion of MSFC's printing/reproduction requirements are met by an on-site reproduction plant operated by MSFC personnel. This reproduction plant produces approximately 18,000,000 units of reproduction work each year. In addition to the on-site reproduction plant, MSFC must also purchase from the Government Printing Office (GPO), Army, and private firms about 33,000,000 units of printing each year. This purchased printing is either an overflow requirement that cannot be handled within the on-site workload, or is such a type that cannot be handled with the limited capability of the on-site equipment. Included in the cost of printing and reproduction are four support contractor workyears of effort. The increase from the 1980 budget estimate to the 1980 current estimate is due to the continued high level of program activity requiring reproduction support from GPO. Increases in 1981 allow for increases in labor and materials consistent with the 1980 level of effort.

C. <u>Transportation</u>	<u>2,639</u>	<u>2,325</u>	<u>2,114</u>	<u>2,638</u>
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Transportation functions at MSFC include 56 workyears of support contractor effort for operation and maintenance of vehicles and aircraft, transportation related supplies and materials, purchase of transportation equipment, and transportation of things. Included in this category is the maintenance of 334 general purpose vehicles, 318 pieces of material handling equipment, 106 general and special purpose trailers and vehicles, 290 pieces of equipment such as "A" frame cranes, "H" frame cranes, cranes, tractors, generators, and welders; intermediate inspections at 6,000 miles or six months; and major inspections at 12,000 miles or twelve months. Freight charges for shipment by both surface and air transportation of materials and equipment are also included. The decrease from 1980 budget estimate to the 1980 current estimate is due to reduced requirements for transportation of things and a decrease in purchase of motor vehicles and equipment. The increase from the 1980 current estimate to the 1980 estimate is due to an increase in cost of material and equipment for maintenance and support contractors.

D. <u>Installation Common Services</u>	<u>3,175</u>	<u>2,841</u>	<u>3,222</u>	<u>3,476</u>
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This category includes 63 workyears of support contractor effort and provides support to Center Management and staff activities, medical services, and various other installation support services. The increase from the 1980 budget estimate to the current estimate is due primarily to increased logistics support effort which is required by increased program hardware activity. The 1981 estimate is level with the 1980 effort.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Center management and staff functions.....				31
Includes Patent Counsel Services, Tort Claims, and Equal Opportunity activities.				
2. Medical services.....				787
Provides occupational medicine and environmental health services totaling 18 workyears of support contractor effort for the maintenance and improvement of employee health at MSFC, with emphasis on prevention, diagnosis, treatment, and care of illnesses and injuries caused or aggravated by the work environment.				
3. Installation support services.....				2,658
Maintenance and repair of office equipment, equipment rental, acquisition of supplies and materials and miscellaneous services are included in this activity				
a. Maintenance and repair of equipment.....				515
Maintenance and repair of office equipment includes the maintenance and repair services for office machines and equipment (i.e., typewriters, calculators, time stamp equipment); maintenance and repair services for photographic and reproduction equipment (i.e., enlargers, cameras, exposure controls print copiers, projectors, power supplies, tape recorders, stroboflash, film viewer, motion analyzer, copiers, copy camera, processor camera, super diazo).				
b. Rental of equipment.....				205
Rental of equipment such as Xerox machines at the resident office at Canoga Park, California and Visual Search Microfilm Files located at MSFC, and other reproduction equipment are included in this category.				
c. Supplies, materials, and equipment.....				503
Acquisition of primarily office type supplies and equipment.				

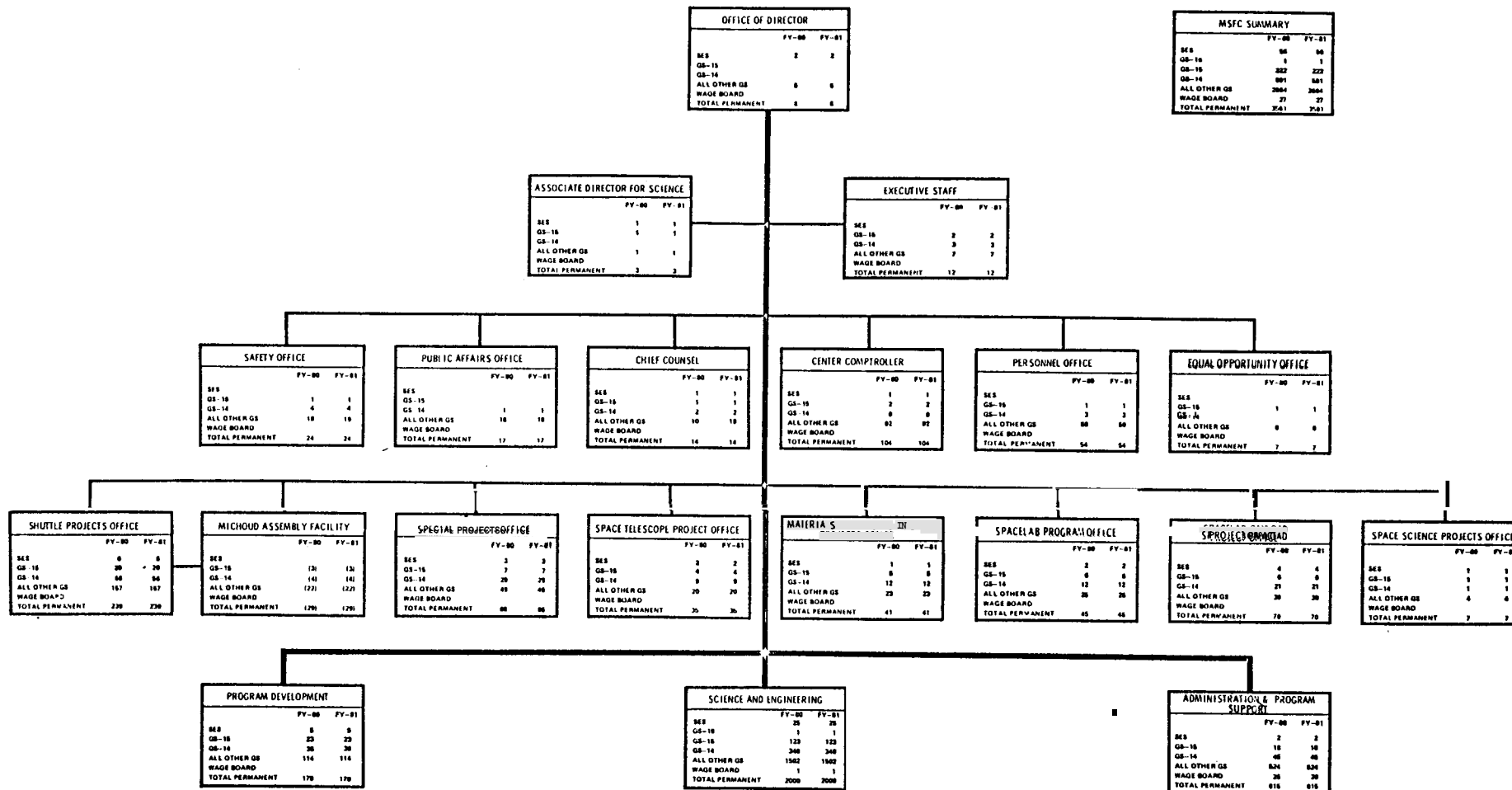
1979 <u>Actual</u>	<u>1980</u>		1981
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)			

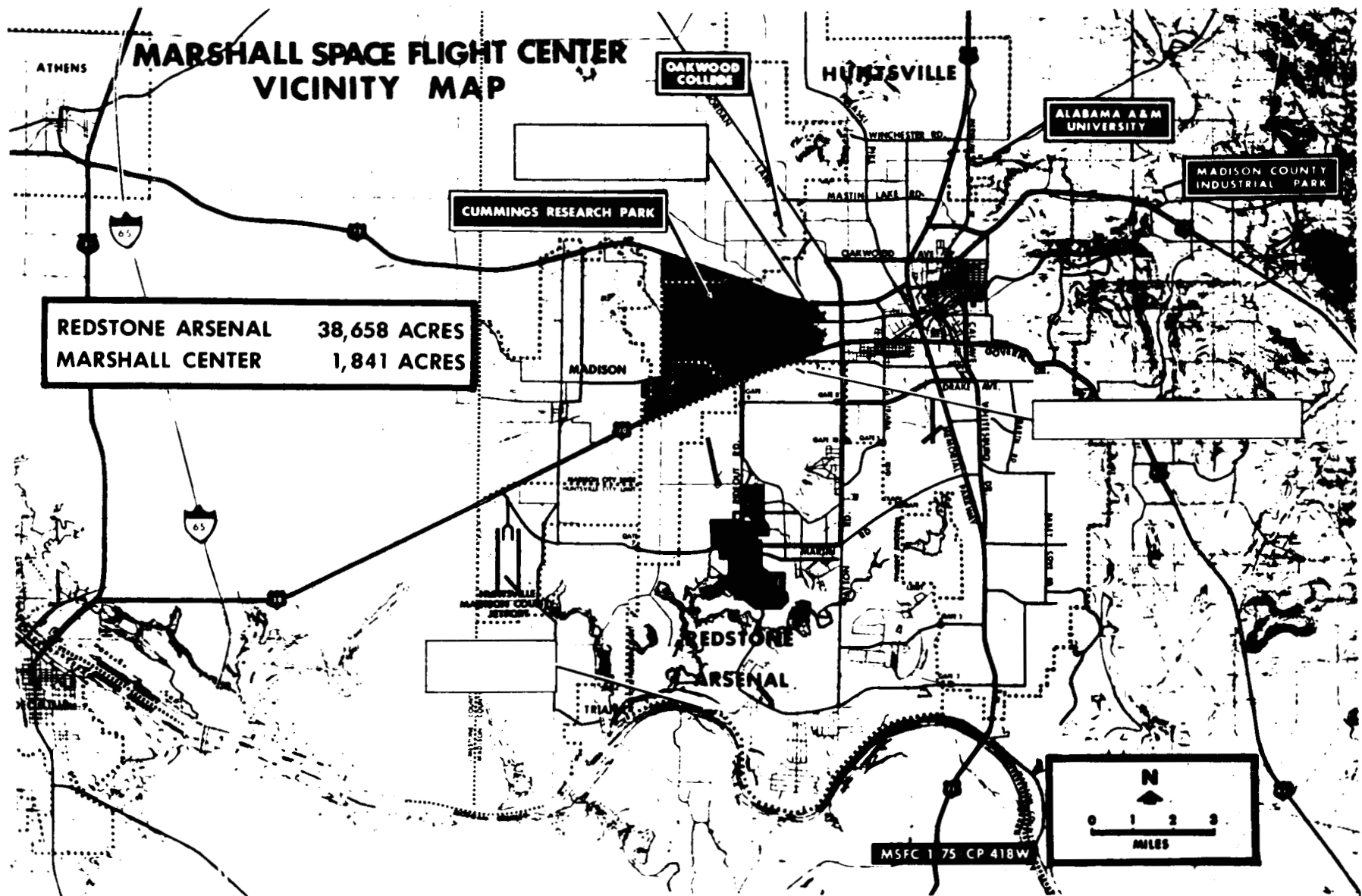
d. Miscellaneous services..... 1,435

Provides services required in support of the property management function in the areas of: (1) receiving supplies, materials, and equipment; (2) distributing supplies, materials, equipment, and program-critical hardware; (3) preparing supplies, materials, and equipment for shipment to include packing and crating and constructing required shipping containers according to government-provided specifications; and (4) warehousing of raw materials.

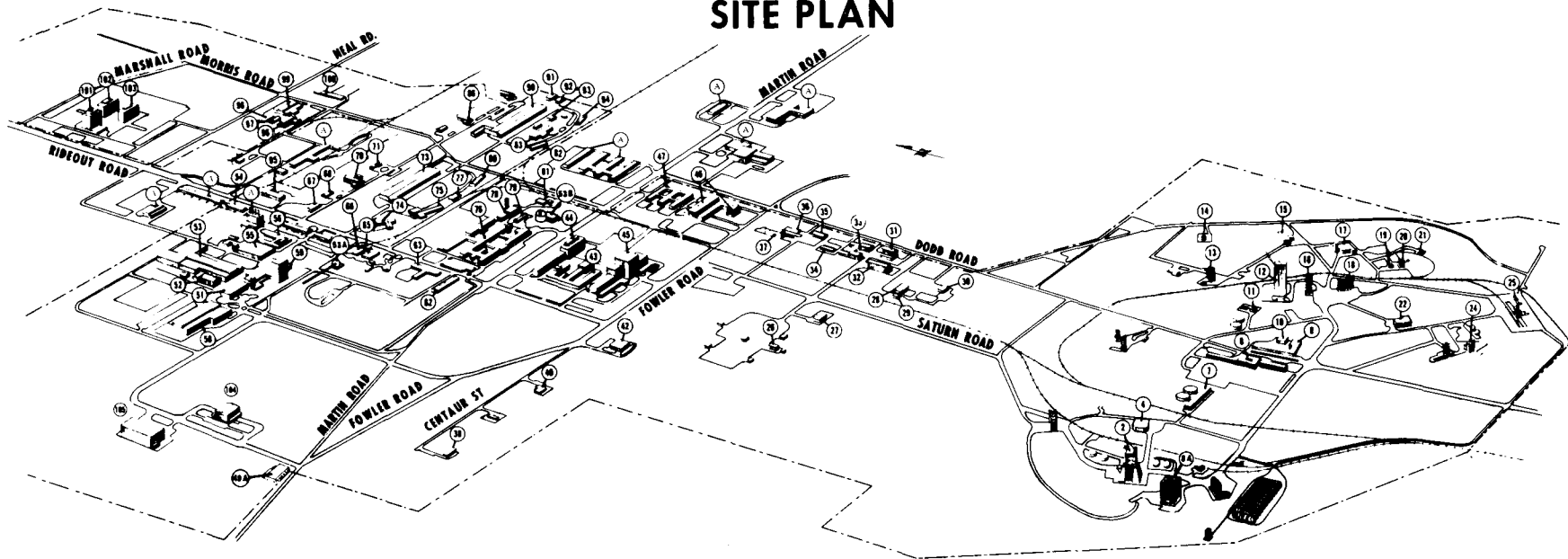
Also provided are such services as the disposal of toxic wastes; inspection of hazardous cargo prior to entry to Redstone Arsenal; receipt, storage, and issue services for hazardous compounds such as explosives, pyrotechnics and solid rocket motors; minor services such as laundry, furniture repair, potassium cyanide disposal, postage, Patent Counsel, tort claims, Equal Opportunity Office; miscellaneous troop service charges, for military detailees assigned to MSFC and imposed by the U.S. Army on Redstone Arsenal; and acquisition of supplies and materials.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GEORGE C. MARSHALL SPACE FLIGHT CENTER





MARSHALL SPACE FLIGHT CENTER SITE PLAN



HEADQUARTERS AREA

95	4207	COMMUNICATIONS FACILITY
96	4241	SHOP AND STORAGE BUILDING
91	S-4244	STORAGE BUILDING
98	S-4251	EQUIPMENT SHED
99	4250	OFFICE AND SHOP BUILDING
100	4249	OFFICE BUILDING
102	4200	OFFICE BUILDING
102	4202	OFFICE BUILDING
103	4201	OFFICE BUILDING

LAB AND SUPPORT AREA

38	4628	CRYOGENIC TESTING FACILITY
40	4623	LABORATORY BUILDING
42	4605	NON-DESTRUCTIVE EVALUATION LABORATORY
43	4612	MATERIALS LABORATORY
44	4610	OFFICE AND ENGINEERING BUILDING
45	4619	STRUCTURES AND MECHANICS LABORATORY
46	4650	SHOP AND CALIBRATION LABORATORY
47	4663	COMPUTER FACILITY
49A	4740	WATER POLLUTION CONTROL FACILITY
50	4708	ENGINEERING AND DEVELOPMENT LABORATORY
51	4760	SURFACE TREATMENT FACILITY
52	S-4706	NEUTRAL BUOYANCY FACILITY
53	4706	FABRICATION AND MACHINE SHOP
53A	4775	HIGH REYNOLDS FACILITY
53B	4467	CELESTIAL & OPTICAL SENSORS FACILITY

54	4123	TRAINING FACILITY
56	4711	DEVELOPMENTAL PROCESSES LABORATORY
56	4712	OFFICE BUILDING
59	4707	SHOP AND ASSEMBLY BUILDING
62	S-4747	AIR COMPRESSOR BUILDING
63	4746	CALIBRATION LABORATORY
65	4732	BISONIC WIND TUNNEL FACILITY
66	4733	IMPULSE BASE FLOW FACILITY
67	4306	OFFICE BUILDING
68	4312	OFFICE BUILDING
10	4313	SHOP BUILDING
71	4332	ENVIRONMENTAL TEST LABORATORY
13	4471	STORAGE AND OFFICE BUILDING
14	4485	OFFICE BUILDING
75	4491	OFFICE AND LABORATORY BUILDING
16	4487	LABORATORY AND OFFICE BUILDING
11	S-4479	STORAGE SHED
78	4476	ENVIRONMENTAL TEST FACILITY
19	S-4436	AUTOMATION CHECKOUT BUILDING
80	4492	ELECTRICAL SYSTEMS LABORATORY BUILDING
81	4475	HAZARDOUS OPERATIONS LABORATORY
82	4493	SHOP AND STORAGE BUILDING

83	4483	VEHICLE MAINTENANCE SHOP
86	4353	PHOTO LAB
90	4481	SPACE SCIENCES LABORATORY
91	S-4498	STORAGE BUILDING
92	S-4499	STORAGE BUILDING
93	4482	TRANSPORTATION SUPPORT BUILDING
94	4494	CEWER ACTIVITIES BUILDING
104	4752	MULTIPURPOSE HIGH BAY FACILITY
105	4755	HIGH BAY ASSEMBLY FACILITY

TEST AREA

WEST AREA

2	4670	PROPULSION & STRUCTURAL TEST FACILITY
4	4674	BLOCKHOUSE
7	4667	PUMP HOUSE
8	4666	OFFICE BUILDING
8A	4699	STRUCTURAL TEST FACILITY

EAST AREA

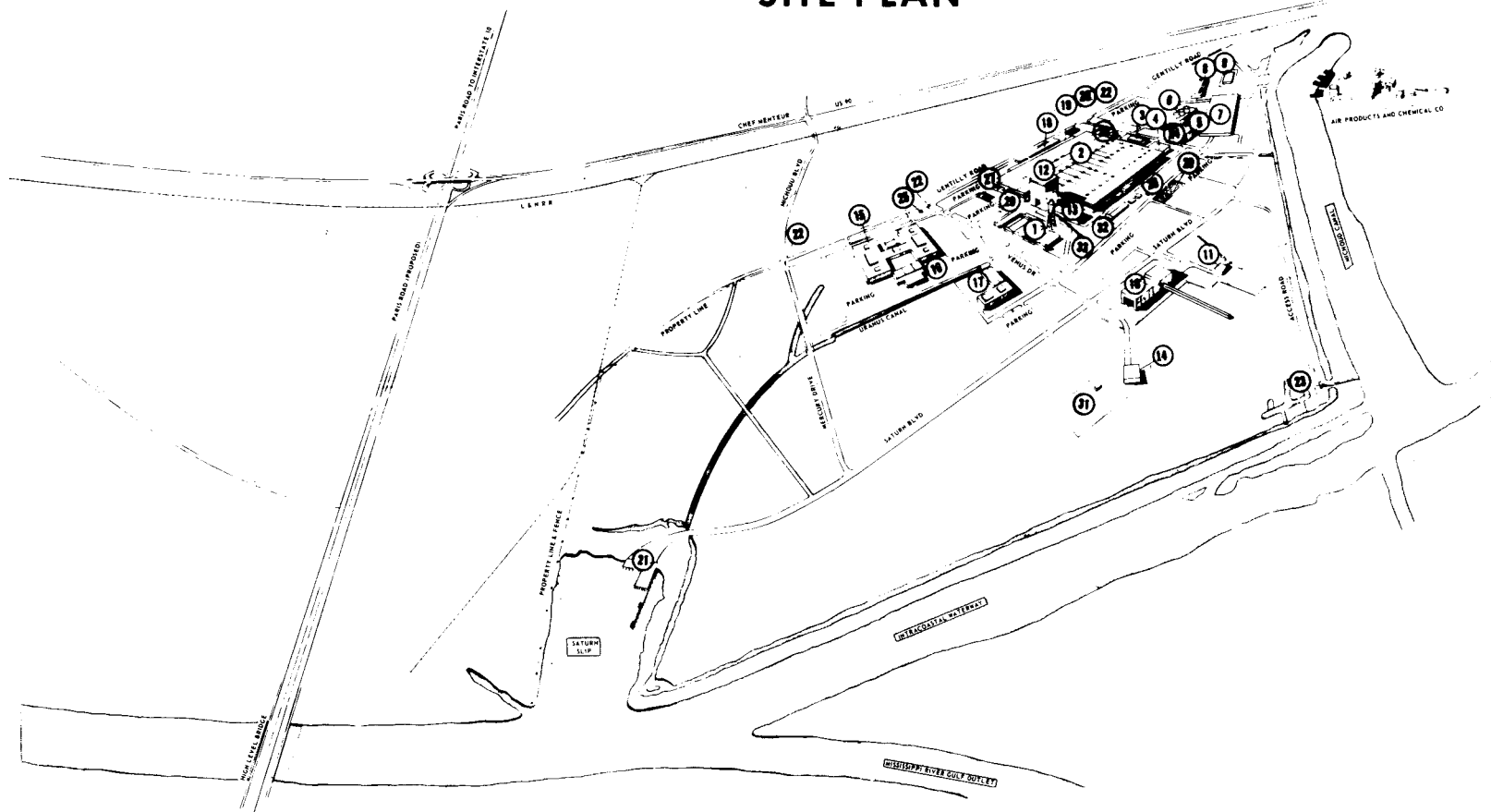
9	4566	DOCUMENTATION REPOSITORY
10	4567	PUMP AND BOILER HOUSE
11	S-4549	DEIONIZED WATER PLANT

12	4550	STRUCTURAL TEST FACILITY
13	4522	PROPULSION SYSTEMS COMPONENT TEST STAND
14	4530	PROPULSION SYSTEMS COMPONENT TEST STAND
15	4561	SHOP AND LABORATORY BUILDING
16	4557	STRUCTURAL TEST FACILITY
17	4583	TEST AND DATA RECORDING FACILITY
18	4548	PROPULSION SYSTEMS COMPONENT TEST FACILITY
19	S-4539	TEST STAND SUPPORT BUILDING
20	4540	MODEL PROPULSION SYSTEMS TEST STAND (ACOUSTIC)
21	4541	TEST STAND CONTROL BUILDING
22	4510	BLOCKHOUSE AND CABLE TUNNELS
24	4514	PROPULSION SYSTEMS TEST STAND
25	4512	PROPULSION AND STRUCTURAL TEST FACILITY

TEST SUPPORT AREA

26	4646	OFFICE BUILDING
27	4648	HIGH PRESSURE TEST FACILITY
28	S-4659	HPGN FACILITY
29	S-4660	BOILER PLANT
30	S-4647	COMPRESSOR BUILDING
31	S-4655	MULTIPURPOSE HIGH BAY FACILITY
32	S-4656	HYDRAULIC EQUIPMENT DEVELOPMENT FACILITY
33	S-4653	COMPONENTS SERVICE BUILDING
34	4618	OFFICE AND STORAGE BUILDING
35	S-4654	OFFICE BUILDING
36	S-4651	SHOP BUILDING
31	4649	MULTIPURPOSE HIGH BAY FACILITY

MICHOUD ASSEMBLY FACILITY SITE PLAN



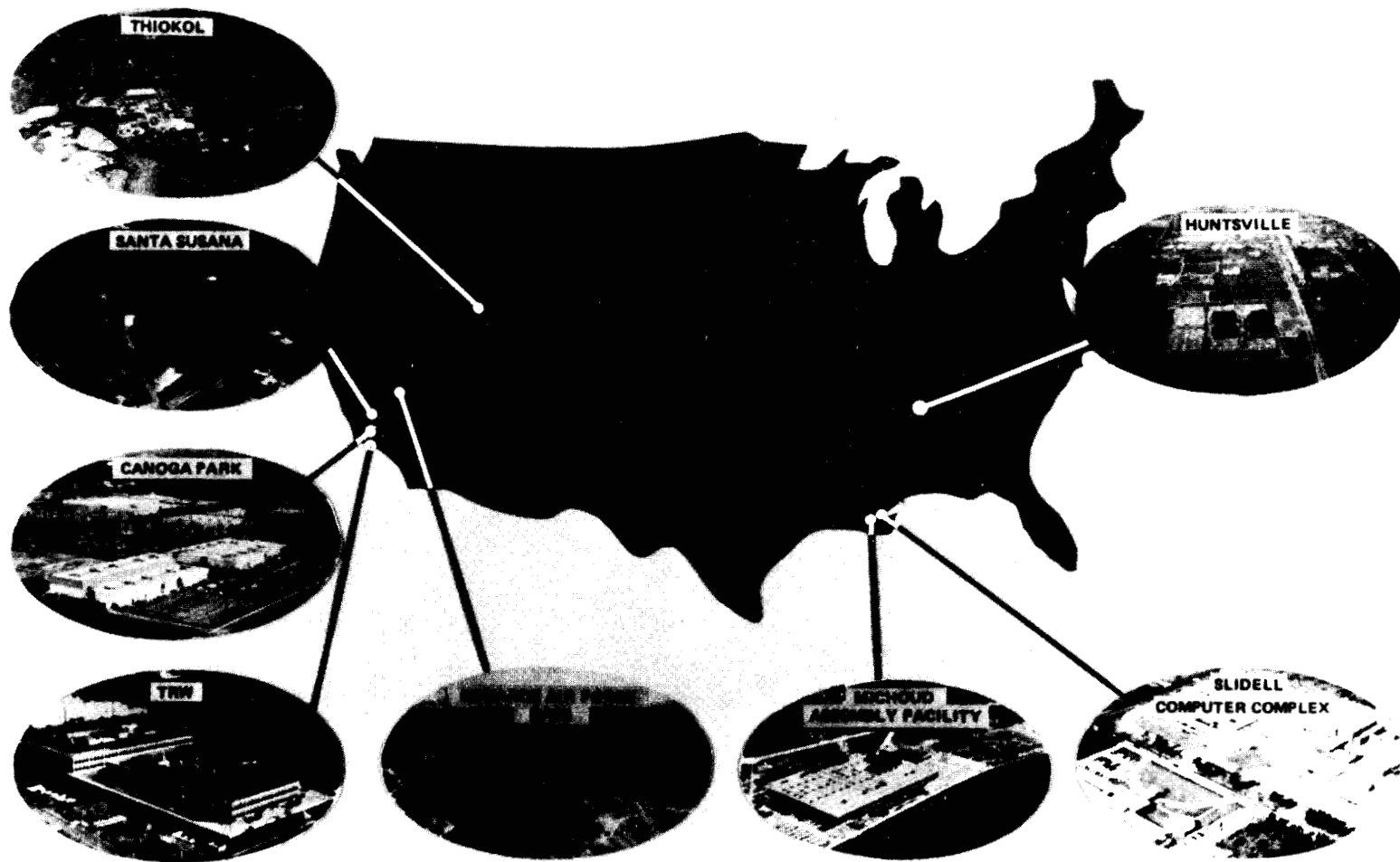
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|---|-----|----------------------------|
| 1 | 303 | HANGAR |
| 2 | 103 | MANUFACTURING |
| 3 | 111 | LABORATORY |
| 4 | 104 | BATTERY CHARGING 6 STORAGE |
| 5 | 207 | BOILER HOUSE |
| 6 | 202 | COOLING TOWER |
| 7 | 220 | COMPONENT SUPPLY |
| 8 | 203 | MAINTENANCE SUPPLY |
| 9 | 221 | HAZARDOUS MATERIAL STORAGE |

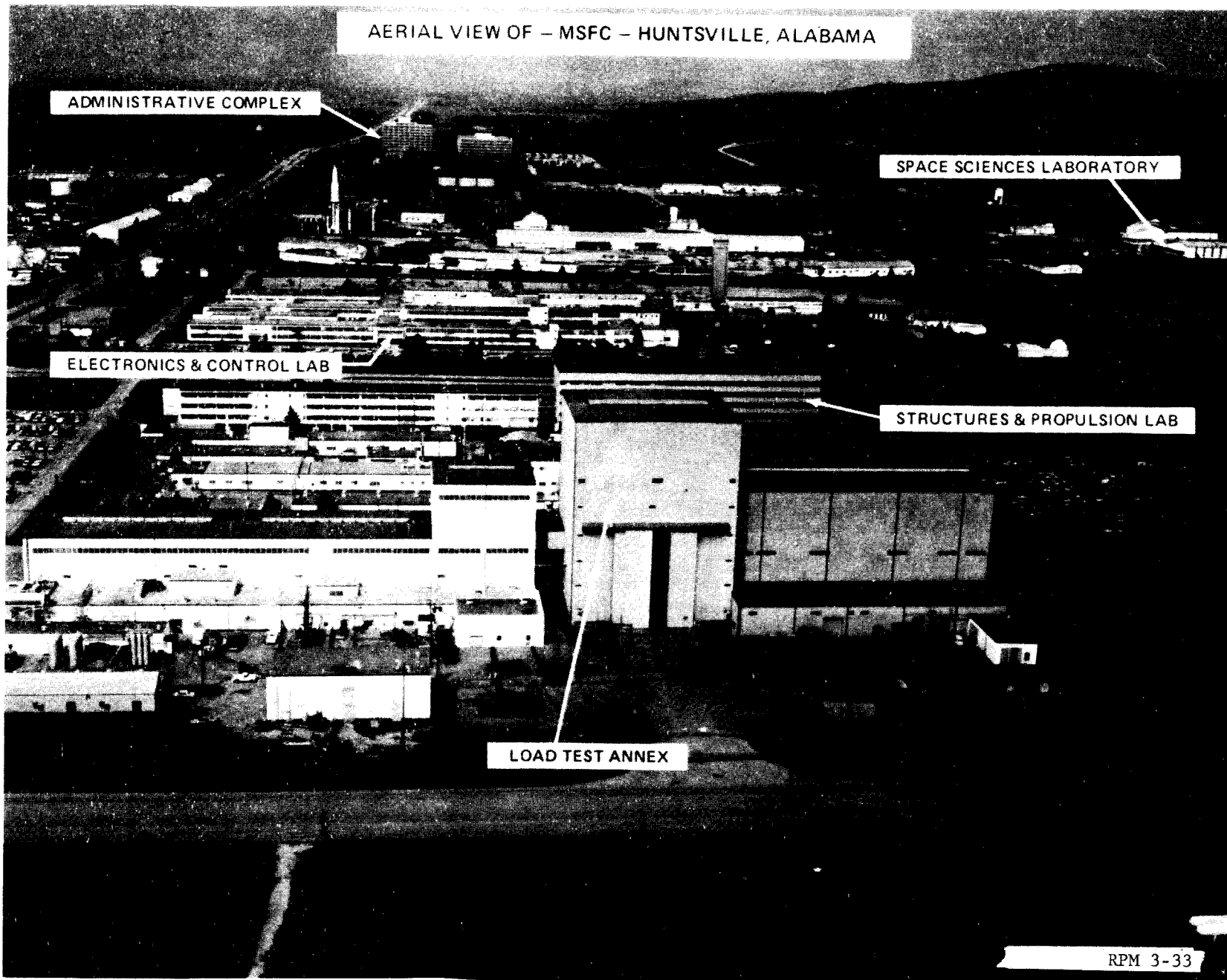
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|----|-----|---------------------------------|
| 15 | 350 | OFFICE AND ENGINEERING BUILDING |
| 16 | 351 | CAFETERIA |
| 17 | 320 | CONTRACTOR SERVICES BUILDING |
| 18 | 101 | ADMINISTRATION |
| 19 | 102 | ENGINEERING |
| 20 | 301 | MAINTENANCE SHOP |

- | | | |
|----|------|------------------------|
| 24 | 201 | PUMP STATION NO 1 |
| 25 | 304 | PUMP STATION NO 3 |
| 26 | 143 | PUMP STATION NO 4 |
| 27 | 308 | WEST MASTER SUBSTATION |
| 28 | 121 | MAIN SUBSTATION |
| 29 | 170 | CHEMICAL WASTE LAAGOON |
| 30 | 119 | PAINT SHOP |
| 31 | 403 | SALVAGE YARD |
| 32 | 105 | TRANSPORTATION |
| 33 | 1302 | ELEVATED WATER TOWER |

MARSHALL SPACE FLIGHT CENTER

PROGRAM FACILITIES

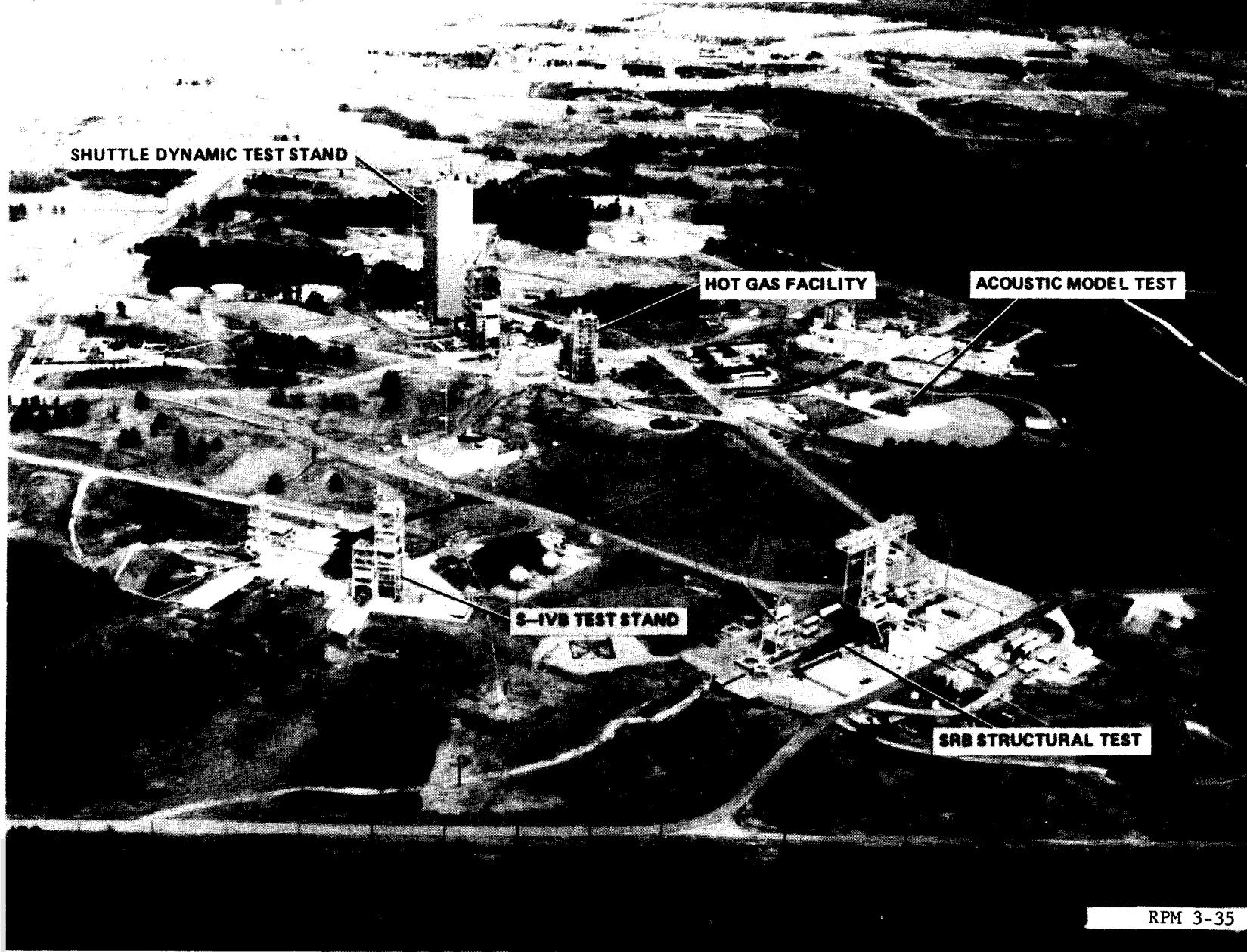




SCIENCE & ENGINEERING AREA - MSFC, HUNTSVILLE



EAST TEST AREA – MSFC, HUNTSVILLE



MICHOUD ASSEMBLY FACILITY



- | | | |
|------------------------------|----------------------------------|---------------------------------|
| 1. MAINTENANCE SUPPLY | 9. FABAREA | 17. CAFETERIA |
| 2. HAZARDOUS MATLS STORAGE | 10. FABAREA | 18. CONTRACTOR SERVICES BLDG, |
| 3. COMPONENT SUPPLY | 11. ENGINEERING BUILDINGS | 19. TEST & CHECK OUT |
| 4. BOILER PLANT & FUEL TANKS | 12. VERT ASSY & HYDROSTATIC TEST | 20. SALVAGE YARD |
| 5. BATTERY CHARGING | 13. SYSTEMS ENGINEERING BLDG. | 21. HIGH PRESSURE TEST FACILITY |
| 6. COOLING TOWER | 14. HANGAR | 22. MAIN PUMPING STATION |
| 7. LABORATORY | 15. MAINTENANCE | 23. BARGE DOCK |
| 8. CHEMICAL WASTE RESERVOIR | 16. ENGINEERING & OFFICE BLDG. | 24. PNEUMATIC TEST FACILITY |

NATIONAL SPACE
TECHNOLOGY
LABORATORIES

RESEARCH AND PROGRAM MANAGEMENT
FISCAL YEAR 1981 ESTIMATES
NATIONAL SPACE TECHNOLOGY LABORATORIES

DESCRIPTION

The National Space Technology Laboratories is located in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. Total land area is 138,807 acres of which 13,480 acres make up the actual installation owned by NASA. The remaining 125,327 acres are held as a buffer zone. In the buffer zone, 7,162 acres are owned by NASA, and 118,165 acres are under restrictive easements. The installation has deep water access via the Pearl River and the Intracoastal Waterway. Capital investment for the National Space Technology Laboratories as of September 30, 1979 was \$310,280,000.

CENTER ROLES AND MISSIONS

The National Space Technology Laboratories (NSTL), formerly the Mississippi Test Facility (MTF), was constructed and operated during the 1960's for acceptance testing of the booster stages of the Saturn V rocket system. NSTL is NASA's prime static test facility for large liquid propellant rocket engines and propulsion systems. The redesignation by NASA of MTF to the new NSTL in June 1974 recognized the emerging role of the installation in space and environmental technology efforts.

NSTL is presently engaged in development and acceptance testing of the Space Shuttle Main Engines and development testing of the Shuttle's Main Propulsion Test Article. NSTL also conducts applied research, develops techniques and demonstrates and transfers to the user community applications of NASA-developed technology in the fields of remote sensing, satellite communication, environmental sciences, and other selected applications programs. NSTL manages the installation and, through interagency agreements, provides service support and full utilization of all facilities by NASA and including collocated elements of other executive agencies engaged in compatible research, development, and operational activities. These include the Department of Interior, the Department of Commerce, the Environmental Protection Agency, the Department of Transportation, the Department of Defense, the State of Mississippi, and the State of Louisiana. The principal roles are:

Space Shuttle - NSTL provides, maintains and manages the facilities and the related capabilities required for the development and acceptance testing of the Space Shuttle Main Engines and the development testing of the Shuttle's Main Propulsion Test Article which consists of a cluster of three main engines, an external tank and an orbiter aft-fuselage structure.

Space Applications - Conducts applied research, develops techniques, demonstrates and transfers to the user community applications of NASA-developed technology in the fields of remote sensing, satellite communication and environmental sciences.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1981 <u>Budget Estimate</u>
I. Personnel and Related Costs.....	3,040	3,151	3,374	3,444
II. Travel.....	131	99	137	147
III. Facilities Services.....	1,125	1,173	1,173	1,286
IV. Technical Services.....	49	41	41	43
V. Management and Operations.....	<u>143</u>	<u>225</u>	<u>174</u>	<u>188</u>
Total, fund requirements.....	<u>4,488</u>	<u>4,689</u>	<u>4,899</u>	<u>5,108</u>

Distribution of Permanent Positions by Programs

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> <u>Current Estimate</u>		<u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
Space shuttle.....	5	5	5	5

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	<u>Current Estimate</u>	1981 <u>Budget Estimate</u>
<u>Space and Terrestrial Applications</u>	<u>39</u>	<u>39</u>	<u>39</u>	<u>39</u>
Space applications	37	39	39	39
Technology utilization	2	---	---	---
Subtotal, direct positions	<u>44</u>	<u>44</u>	<u>44</u>	<u>44</u>
<u>Center Management and Operations Support Positions</u>	<u>60</u>	<u>59</u>	<u>59</u>	<u>59</u>
Total, permanent positions	<u>104</u>	<u>103</u>	<u>103</u>	<u>103</u>

PROGRAM DESCRIPTION

	<u>Permanent Positions (Civil Service)</u>
<u>SPACE SHUTTLE</u>	5

In 1981 the National Space Technology Laboratories will continue to provide, maintain, and manage the facilities and the related capabilities required for development and acceptance testing of the Space Shuttle Main Engines and the development testing of the Shuttle's Main Propulsion Test Article, which consists of a cluster of three main engines, an external tank and an orbiter aft-fuselage structure.

<u>SPACE APPLICATIONS</u>	39
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In 1981 the National Space Technology Laboratories' Earth Resources Laboratory's program will continue:

a. To conduct research investigations in the application of remotely sensed data, stressing interests and needs of potential user agencies. This research activity uses existing aircraft and satellite programs as a basic source of remotely sensed data in conjunction with surface data to develop techniques and procedures for practical applications, and to devise cost-effective methods of transferring those techniques to the user agencies.

b. To conduct applications demonstration projects in cooperation with Federal, state, regional and local government agencies and private industry to promote the effective transfer of applications technology as well as to reduce systems costs, increase adaption to the users systems, and improve compatibility with other information sources and products routinely used by the user organization.

- c. To systematically transfer, primarily to state and local governments in the 17 state region in the mid-west, south and southeast, the ability to effectively use Landsat data for their resource management and planning decisions through the Southern Regional Remote Sensing Applications Center.
- d. To conduct research, develop applications and transfer technology to the user community in non-remote sensing applications primarily in such areas as data collection systems, environmental system development, and closed ecosystems development.

Permanent Positions
(civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT 59

Center Management and Operations Support is defined as that support or services being provided to all National Space Technology Laboratories organizations which cannot be directly identified to a benefiting program or project. The civil service personnel involved are:

Manager and Staff - The Center Manager, Deputy Manager, and immediate staff, e.g. Legal, Patent Counsel, Equal Opportunity, and Public Affairs.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Centerwide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support
- Safety

RESOURCES REQUIREMENTS BY FUNCTION

	1979 <u>Actual</u>	<u>1980</u>		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
I. PERSONNEL AND RELATED COSTS.....	<u>3.040</u>	<u>3.151</u>	<u>3.374</u>	<u>3.444</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent Positions.....	2.668	2.768	2.942	2.971
b. Other than full time permanent positions.....	78	79	118	145
c. Overtime and other compensation.....	<u>8</u>	<u>13</u>	<u>13</u>	<u>15</u>
Subtotal. Compensation.....	2.754	2.860	3.073	3.131
2. <u>Benefits</u>	<u>270</u>	<u>273</u>	<u>279</u>	<u>288</u>
Subtotal. Compensation and Benefits.....	<u>3.024</u>	3.133	<u>3.352</u>	<u>3.419</u>
B. <u>Supporting Costs</u>				
1. Transfer of Personnel.....	8	10	10	10
2. Personnel Training.....	<u>8</u>	<u>8</u>	<u>12</u>	<u>15</u>
Subtotal. Supporting Costs.....	<u>16</u>	<u>18</u>	<u>22</u>	<u>25</u>
Total. Personnel and Related Costs.....	<u>3.040</u>	<u>3.151</u>	<u>3.374</u>	<u>3.444</u>

Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u>	3,024	3,133	3,352	3,419
1. <u>Operation</u>	2,754	2,860	3,073	3,131
a. Permanent positions.....	2,668	2,768	2,942	2,971

The funds shown will support 103 permanent positions in 1981. The current estimate for 1980 reflects an increase over the 1980 budget estimate due to the October 1979 pay increase.

Basis of Cost for Permanent Positions

In 1981 the cost of permanent positions will be \$2,971,000, an increase of \$29,000 over 1980. The increase results from the following:

Cost of permanent positions in 1980.....	2,942
Cost increases in 1981.....	+66
Within grade and career advances:	
Full year effect of 1980 at <u>inc</u>	+37
Partial year effect of 1981 at <u>inc</u>	+24
Full year effect of 1980 pay inc <u>inc</u>	+5
Cost decreases in 1981.....	-37
Turnover savings and abolished positions:	
Full year effect of 1980 at <u>inc</u>	-17
Partial year effect of 1981 at <u>inc</u>	-11
One less paid day in 1981.....	-9
Cost of permanent positions in 1981.....	<u>2,971</u>

	1979	1980		1981
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

b. Other than full-time permanent positions

1. C	78	79	118	145
2. Workyears.....	9	9	13	15

The 1981 distribution of workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	4
Opportunity programs.....	5
Other temporary employment.....	<u>6</u>
Total.....	<u>15</u>

The increase from the 1980 budget estimate to the 1980 current estimate is a result of the assignment of the three part-time permanent positions, and the new White House Research Apprenticeships program. The 1981 estimate includes the scheduled build-up of the Research Apprenticeships program.

c. Overtime and other operation	8	13	13	15
--	---	----	----	----

The overtime levels shown are necessary to meet management and administrative requirements in such areas as procurement and financial management.

2. Benefits.....	<u>270</u>	<u>273</u>	<u>279</u>	<u>288</u>
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The following table reflects the personnel benefits by major category:

Civil Service Retirement and	201	201	206	212
Employee life insurance	12	13	14	15
Employee health insurance.....	56	58	58	60
FICA.....	<u>1</u>	<u>1</u>	<u>1</u>	1
Total.....	<u>270</u>	<u>273</u>	<u>279</u>	<u>288</u>

The increase from the 1980 budget estimate to the 1980 current estimate is a result of the October 1979 pay increase. The increase in 1981 is due to the full year effect of the October 1979 pay increase.

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1981 <u>Budget</u> <u>Estimate</u>
B. <u>Supporting Costs</u>	<u>16</u>	<u>18</u>	<u>22</u>	<u>25</u>
1. Transfer of personnel.....	8	10	10	10
The amount estimated for 1981 is based on the planned personnel turnover.				
2. Personnel training.....	8	8	12	15

The personnel training costs are primarily for "Upward Mobility" training for women and minorities, and Equal Employment Opportunity (EEO) "Counsel Training." The increase of the 1980 current estimate over the 1980 budget estimate and the increase in 1981 is due to the greater demand for upward mobility training and Civil Service Reform Act implementation training.

II. <u>TRAVEL</u>	<u>131</u>	<u>99</u>	<u>137</u>	<u>147</u>
<u>Summary of Fund Requirements</u>				
A. Program Travel.....	61	58	63	67
B. Scientific and Technical Development Travel.....	2	15	3	4
C. Management and Operations Travel.....	<u>68</u>	<u>26</u>	<u>71</u>	<u>76</u>
Total, Travel.....	<u>131</u>	<u>99</u>	<u>137</u>	<u>147</u>

Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Program Travel</u>	<u>61</u>	<u>58</u>	<u>63</u>	<u>67</u>
<p>Program travel requirements are directly related to the accomplishment of the Center's mission, and will mainly be in support of the Space and Terrestrial Applications Office. The increase from the 1980 budget estimate to the 1980 current estimate is to support increased activities in the Earth Resources Laboratory program.</p>				
B. <u>Scientific and Technical Development Travel</u>	<u>2</u>	<u>15</u>	<u>3</u>	<u>4</u>
<p>Scientific and technical development travel will permit employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside NSTL as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reassessment of requirements for meeting and seminar travel associated with the Earth Resources Laboratory program.</p>				
C. <u>Management and Operations Travel</u> ..	<u>68</u>	<u>26</u>	<u>71</u>	<u>76</u>
<p>Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. The 1979 actual, 1980 current estimate and 1981 levels have been adjusted to include the rental costs of GSA vehicles for the Earth Resources Laboratory, which were included under the Transportation function in the 1980 budget. Also, the 1981 estimate reflects increased travel related to the Earth Resources Laboratory program.</p>				
111. <u>FACILITIES SERVICES</u>	<u>1,125</u>	<u>1,173</u>	<u>1,173</u>	<u>1,286</u>
<p>The National Space Technology Laboratories (NSTL) covers 138,807 acres of grounds and a complex of facilities which are comprised of laboratories, office, and rocket engine test facilities.</p>				

The complex encompasses some 1,178,177 gross square feet of building space including seven major buildings. Also included are five major technical facilities. This physical plant supports an average daily on-Center population of 3,000 to 3,300 personnel. Many of the test facilities are utilized on schedules involving more than one shift and/or frequently during off-peak hours.

Summary of Fund Requirements

	<u>1979</u> <u>Actual</u>	<u>1980</u>		<u>1981</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
A <u>Maintenance and Related Services</u>				
Facilities.....	111	100	100	100
B <u>Custodial Services</u>	262	246	246	246
C <u>Utilities Services</u>	<u>752</u>	<u>827</u>	<u>827</u>	<u>940</u>
Total, Facilities Sis	<u>1,125</u>	<u>1,173</u>	<u>1,173</u>	<u>1,286</u>

Explanation of Fund Requirements

A. <u>Maintenance and Related Sis</u>	<u>111</u>	<u>100</u>	<u>100</u>	<u>100</u>
Facilities.....	111	100	100	100

This activity, requiring 1 workyear of effort, provides for the modifications and alterations of facilities for normal recurring movements of personnel and equipment of the Earth Resources Laboratory.

B. <u>Custodial Services</u>	<u>262</u>	<u>246</u>	<u>246</u>	<u>246</u>
------------------------------------	------------	------------	------------	------------

Provides security guard services, janitorial services and fire protection to the Earth Resources Laboratory personnel by the National Space Technology Laboratories institutional support services contractor.

C <u>Utility Services</u>	<u>752</u>	<u>827</u>	<u>827</u>	<u>940</u>
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Provides for the purchase of the two utility commodities; electricity from the Mississippi Power Company; and natural gas from the United Gas Pipe Line Company. Natural gas is the primary heating fuel used at NSTL.

The increase from the 1980 current estimate to the 1981 budget estimate is due to an increase in rates. The estimated requirements for these utilities are as follows:

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u>		1981 Budget <u>Estimate</u>
		(Thousands of Dollars)		
1. Electricity (12,560 mW/Hrs).....				510
2. Natural gas (156,300 K cu. ft.).....				430
<hr/>				
IV. <u>TECHNICAL SERVICES</u>	<u>49</u>	<u>41</u>	<u>41</u>	<u>43</u>
<u>Summary of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>				
Operations.....	43	35	35	37
B. <u>Scientific and Technical Information</u>				
Library	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>
Total, Technical Services.....	<u>49</u>	<u>41</u>	<u>41</u>	<u>43</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>	<u>43</u>	<u>35</u>	<u>35</u>	<u>37</u>
Provides for the supplies, materials and software programs in support of the Earth Resources Laboratory.				
B. <u>Scientific and Technical Information</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>
Provides for the books, periodicals and other technical reports required by the Earth Resources Laboratory.				

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate,</u> <u>Estimate</u> (Thousands of Dollars)		1981 <u>Budget Estimate</u>
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>143</u>	<u>225</u>	<u>174</u>	<u>188</u>
<u>Summary of Fund Requirements</u>				
A. Administrative Communications.....	22	25	25	25
B. Printing and Reproduction.....	30	47	47	48
C. Transportation.....	14	56	14	18
D. Installation Common Services.....	<u>77</u>	<u>97</u>	<u>88</u>	<u>97</u>
Total, Management and Operations.....	<u>143</u>	<u>225</u>	<u>174</u>	<u>188</u>

Explanation of Fund Requirements

A. <u>Administrative Communications</u>	<u>22</u>	<u>25</u>	<u>25</u>	<u>25</u>
Provides for the local telephone service for the Earth Resources Laboratory.				
B. <u>Administrative Printing</u>	<u>30</u>	<u>47</u>	<u>47</u>	<u>48</u>
Provides for printing and reproduction services in support of the Earth Resources Laboratory personnel.				
C. <u>Transportation</u>	<u>14</u>	<u>56</u>	<u>14</u>	<u>18</u>

The estimate includes freight costs, government bills of lading, air freights, other general shipments and related transportation costs. The 1979, 1980 current estimate and 1981 levels have been adjusted to reflect the transfer of rental costs for GSA vehicles to Management and Operations Travel. The 1981 estimate reflects an increase in related transportation costs.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
D. <u>Installation Common Services</u>	<u>77</u>	<u>97</u>	<u>88</u>	<u>97</u>

Provides supplies, materials and equipment for the Earth Resources Laboratory. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reassessment of requirements. The increase in the 1981 budget estimate is due to increased requirements for supplies and materials for use by the Earth Resources Laboratory.

NSTL SUMMARY STAFFING		
	FY 80	FY 81
SES	3	3
GS-16		
GS-15	5	5
GS-14	9	9
All other GS	86	86
TOTAL PERMANENT	103	103

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NATIONAL SPACE TECHNOLOGY LABORATORIES
DECEMBER 4,1979

OFFICE OF THE MANAGER		
	FY 80	FY 81
SES	2	2
GS-16		
All other GS	<u>2</u>	<u>2</u>
TOTAL PERMANENT	4	4

CHIEF COUNSEL		
	FY 80	FY 81
GS-15	1	1
All other GS	<u>1</u>	<u>1</u>
TOTAL PERMANENT	2	2

EXECUTIVE STAFF		
	FY 80	FY 81
GS-14		
All other GS	<u>6</u>	<u>6</u>
TOTAL PERMANENT	6	6

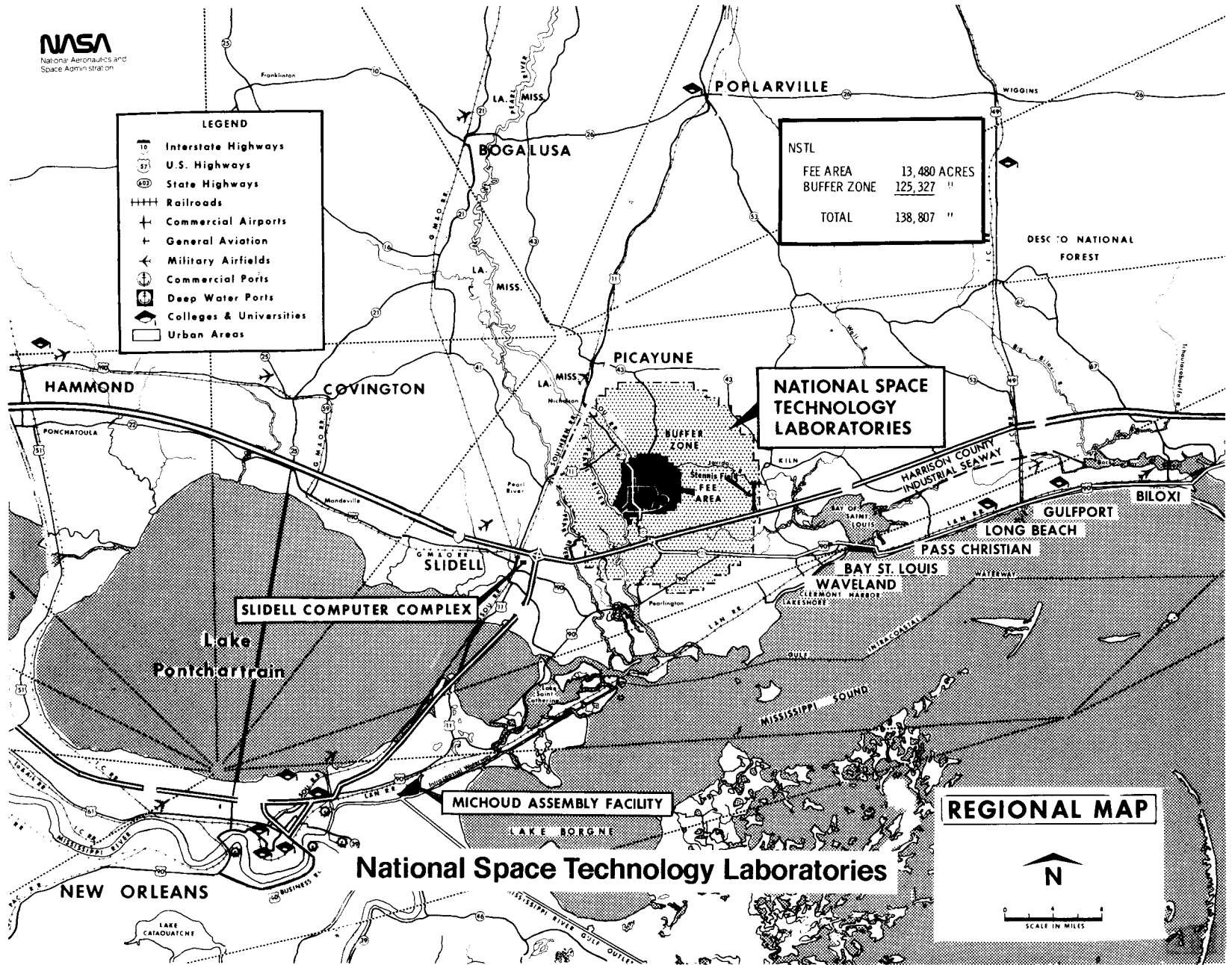
RESOURCES & FINANCIAL MANAGEMENT OFFICE		
	FY 80	FY 81
GS-14	1	1
All other GS	<u>17</u>	<u>17</u>
TOTAL PERMANENT	18	18

PROCUREMENT & CONTRACTS OFFICE		
	FY 80	FY 81
GS-14	1	1
All other GS	<u>11</u>	<u>11</u>
TOTAL PERMANENT	12	12

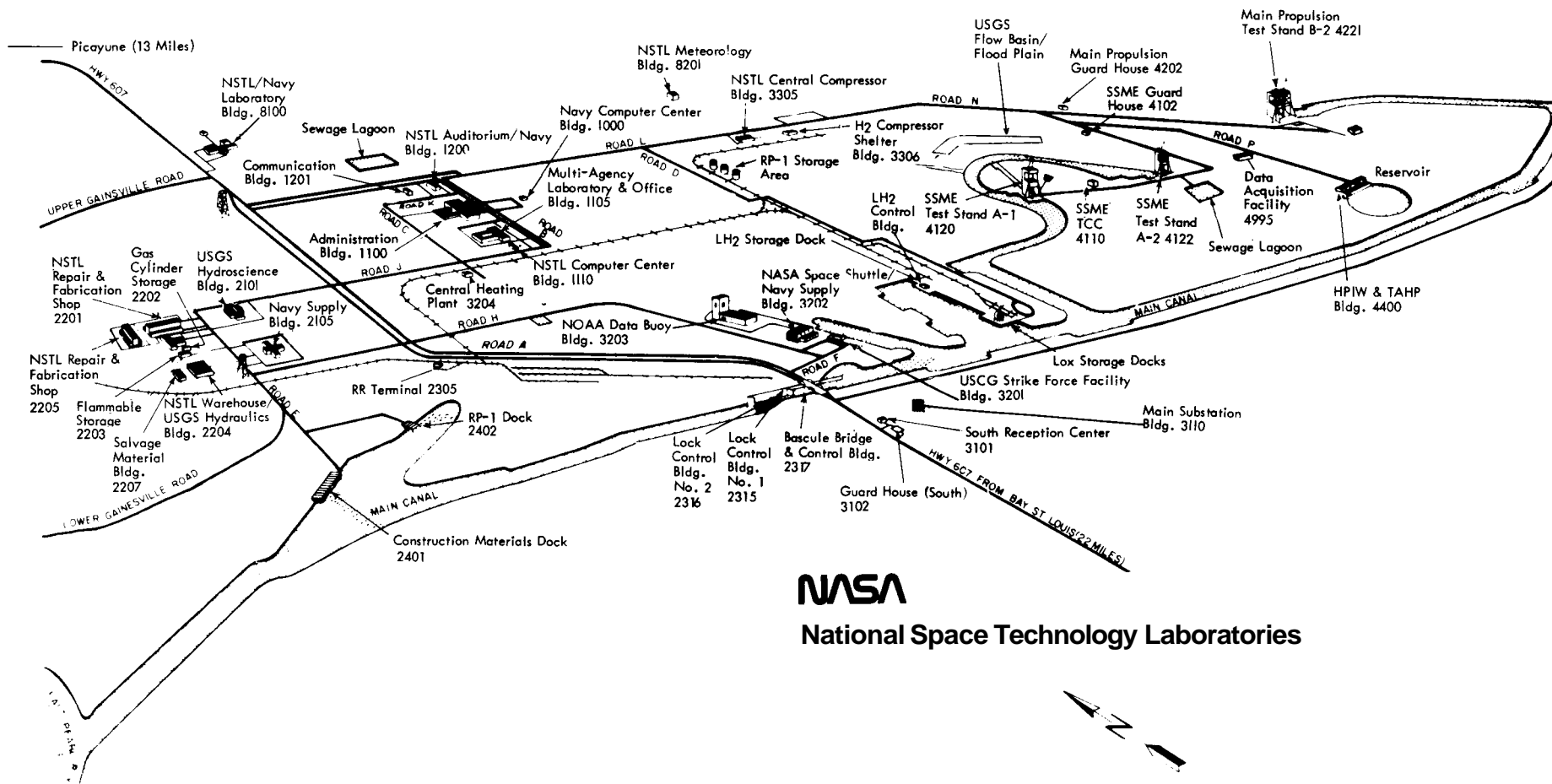
FACILITIES ENGINEERING OFFICE		
	FY 80	FY 81
GS-14	1	1
All other GS	<u>8</u>	<u>8</u>
TOTAL PERMANENT	9	9

INSTALLATIONS OPERATIONS OFFICE		
	FY 80	FY 81
GS-14	2	2
All other GS	<u>11</u>	<u>11</u>
TOTAL PERMANENT	13	13

EARTH RESOURCES LABORATORY		
	FY 80	FY 81
SES	1	1
GS-15	4	4
GS-14	4	4
All other GS	<u>30</u>	<u>30</u>
TOTAL PERMANENT	39	39



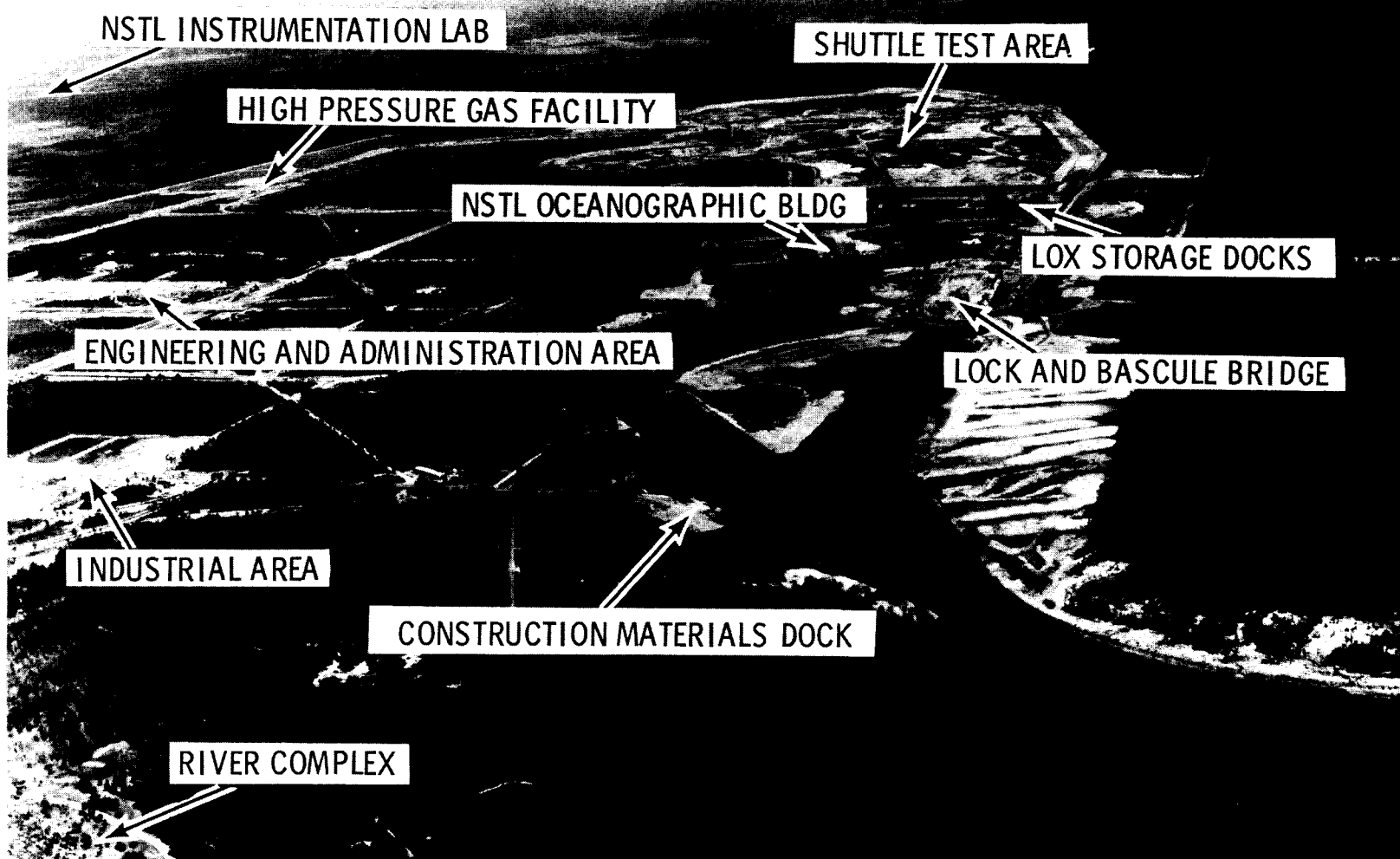
NSTL LOCATION PLAN



NASA

National Space Technology Laboratories

NATIONAL SPACE TECHNOLOGY LABORATORIES-AERIAL VIEW



GODDARD SPACE
FLIGHT CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

GODDARD SPACE FLIGHT CENTER

DESCRIPTION

The Goddard Space Flight Center, located 15 miles northeast of Washington, DC, at Greenbelt, Maryland is situated on a 554-acre main site. Three additional nearby plots of 640 acres comprise the remote site area and contain the Goddard Antenna Test Range, the Goddard Optical Facility, the Propulsion Research Facility, the Magnetic Fields Component Test Facility, the Attitude Control Test Facility, and the Network Training and Test Facility. The total capital investment for the Goddard Space Flight Center, including tracking stations and contractor-held facilities at various locations as of September 30, 1979, was \$692,166,000.

The majority of the Goddard Center's personnel are located at Greenbelt, Maryland; other personnel are located at the Goddard Institute for Space Studies in New York City, and throughout the world, managing the operation of satellite tracking and communications network stations.

CENTER ROLES AND MISSIONS

The Goddard Space Flight Center, established in 1959 as the first major United States installation devoted to the investigation and exploration of space, conducts a wide-ranging program in space science and applications. The Goddard Center has developed many diverse capabilities: the management of complex projects; the development of wholly integrated spacecraft, ranging from systems engineering to development, integration, and testing; the development and operation of satellite tracking networks, data acquisition and analysis; and scientific research to include both theoretical studies and the development of many significant scientific experiments flown on satellites. The principal and supporting roles are:

PRINCIPAL

Earth Orbital Spacecraft Development and Flight Operations - including spacecraft propulsion and supporting technology such as low cost structural evaluation and reliability demonstration, advanced guidance systems and space power systems. Major emphasis is on automated, standard spacecraft systems, free flyers, experiment development and integration, and the planning and conducting of associated flight operations.

Tracking and Data Acquisition Systems and Support Operations - planning, developing and implementing the tracking network, data processing and analysis, communications, and mission control systems and facilities. Planning and conducting support of Earth orbital spacecraft. Includes flight control, tracking, data acquisition, communications, and information processing and analysis. Network planning and implementation support for Shuttle, including Orbital Flight Tests. (Tracking and data acquisition responsibilities include orbital phase acquisition of all mission types such as manned, and deep space).

Spacelab Payloads - developing, analytically integrating and processing data for Spacelab payloads in astrophysics, solar terrestrial physics, astronomy, and assigned applications roles.

Space Physics and Astronomy Payloads and Science - developing the technical discipline base, including astronomical sensors; developing and implementing flight experiments, including space physics and experimentation for planetary missions.

Applications Research and Development - developing the technical discipline base, developing spaceborne sensors, developing ground data processing systems and data analysis systems, and implementing applications experiments for Environmental Observations and Resources Observations.

Upper Atmospheric Research - developing and applying analytical techniques, evaluating advanced instrumentation concepts for atmospheric constituent analysis, and developing concepts for future flight missions.

Information Systems Technology - developing and maintaining a technology base.

Sounding Rocket Development, Procurement and Operations - developing and procuring sounding rockets and carrying out all phases of operations from mission/flight planning to landing and recovery. Includes supporting systems (i.e., guidance, telemetry and attitude control), payload carrier development and development acquisition.) (Most GSFC sounding rocket activities involve the higher performance, more complex vehicle support systems. Most activities involving lower performance vehicle systems are assigned to Wallops Flight Center).

Launch Vehicle Procurement - focusing on Delta procurement for Space Science and Space Applications-oriented missions, reimbursable missions for other Government agencies, domestic commercial users, and international users.

SUPPORTING

Planetary Science - developing and applying techniques for the analysis of planetary atmospheres.

Environmental Observations - contributing to the technical discipline base, developing spaceborne sensors and implementing experiments.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs	107,900	110,150	115,011	115,638
11. Travel	2,384	2,672	2,542	2,712
III. Facilities Services	9,574	10,288	10,547	11,816
IV. Technical Services	2,599	2,325	2,449	3,076
V. Management and Operations	<u>5,453</u>	<u>5,762</u>	<u>5,256</u>	<u>6,093</u>
Total, fund requirements	<u>127,910</u>	<u>131,197</u>	<u>135,805</u>	<u>139,335</u>

Distribution of Permanent Positions by Program

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>120</u>	<u>112</u>	<u>112</u>	<u>72</u>
Space shuttle.....	40	33	32	3
Space flight operations	20	17	21	21
Expendable launch vehicles	60	62	59	48
<u>Space Science</u>	<u>1,080</u>	<u>981</u>	<u>1,006</u>	<u>967</u>
Physics and astronomy	994	908	917	881
Planetary exploration	86	73	89	86

	1979 Actual	1980		1981 Budget Estimate
		Budget Estimate	Current Estimate	
<u>Space and Terrestrial Applications</u>	857	924	922	984
Space applications	846	915	908	971
Technology utilization	11	9	14	13
<u>Aeronautics and Space Technology</u>	88	66	99	128
Space research and technology	88	66	99	128
<u>Space Tracking and Data Systems</u>	606	602	570	538
Tracking and data acquisition	606	602	570	538
Subtotal, direct positions	2,751	2,685	2,709	2,689
<u>Center Management and Operations Support Positions</u>	731	755	731	751
Total, permanent positions	<u>3,482</u>	<u>3,440</u>	<u>3,440</u>	<u>3,440</u>

PROGRAM DESCRIPTION

Permanent Positions
(civil Service)

SPACE SHUTTLE

3

The objective of the Space Shuttle activities at Goddard Space Flight Center (GSFC) is to plan and implement the equipment systems, communications data, voice circuits, and operational procedures required for support during the Orbital Flight Test phase, and the subsequent operational phase of the Shuttle program.

SPACE FLIGHT OPERATIONS

21

The objective of the Goddard activities in this area is to provide the technical support and data to effectively integrate Goddard free-flyer payloads into the Space Transportation System. During 1981, Goddard will perform a variety of studies, utilizing Goddard's scientific and technical base, to better develop the Shuttle Payload requirements and interface for the Goddard free-flyer payloads.

EXPENDABLE LAUNCH VEHICLES 48

The GSFC is the management center for the Delta launch vehicle. The Delta vehicle is NASA's only medium class standard launch vehicle and has the capability of accurately putting a wide variety of spacecraft into a broad spectrum of orbits, ranging from equatorial to polar inclinations. The Delta is used for NASA missions, for a wide range of reimbursable missions for other Government agencies, domestic commercial users, and international users. The Delta program is managed to provide for production of the launch vehicles required for approved missions, to provide the necessary operations support, to maintain production capability for projected missions and to provide for solid propellant upper stages and apogee booster motors. The Delta project provides engineering, quality, and configuration control services to maintain operational capability with high reliability.

PHYSICS AND ASTRONOMY 881

Physics and Astronomy is comprised of research in two major areas: Astrophysics and Solar Terrestrial Research.

Goddard Astrophysics activities have the objectives of: accomplishing laboratory and flight scientific research to increase human knowledge of the Earth's space environment, the stars, and other objects; and providing advanced technical development of experiments and spacecraft components for future astrophysics missions.

To this end, Goddard has organized its activities to accomplish scientific progress in all of the following discipline areas of astrophysics: gamma ray astronomy, X-ray astronomy, ultraviolet and optical astronomy, infrared and radio astronomy, and particle astrophysics.

During 1981, Goddard's investigators will actively be involved in development of instruments for the Space Telescope and Gamma Ray Observatory, and data analysis of data for several major Physics and Astronomy missions; the High Energy Astronomy Observatory, the Dynamics Explorer, and the Solar Maximum Mission.

The spacecraft development will be completed and assembly started for a 1981 launch of the Dynamics Explorer. Additionally, instruments will continue to be fabricated and delivered for testing and evaluation. Government furnished equipment (GFE), standard tape recorders, and the standard ground support equipment for the spacecraft will be delivered to the spacecraft contractor and will include the NASA near-Earth Transponder and the NASA Standard Tracking and Data Relay Satellite System (TDRSS) Transponder.

In 1981, the Internatiocal Ultraviolet Explorer (IUE) spacecraft, with its unique satellite control and data management systems, will continue to afford guest observers the opportunity to point the satellite in real time from the ground, quickly make observations, and receive data in visual formats. Additionally, it is expected that the International Sun-Earth Explorer (ISEE) series will provide unusual opportunities to study the dynamic interactions of solar wind and the Earth's magnetosphere from various points in space.

In 1981, other Explorer efforts will continue. It is anticipated that we will move into development of the following Explorer missions: Active Magnetospheric Particle Tracer Experiment and Cosmic Background Explorer.

Goddard will provide the management and support of NASA Domestic and International Sounding Rocket programs. The project involvement extends from the conception through launch and data analysis in support of research within Galactic Astronomy, High Energy Astrophysics, Solar Physics, Plasma Physics, Aeronomy, Meteorology, Planetary Astronomy, and the space applications of materials processing science. During 1981, we plan to introduce sounding rocket technology to the Shuttle via the mode of Experiments of Opportunity (EOP). This is a cost-effective approach which allows the experimenter to obtain scientific data from an instrument designed to fly on a sounding rocket or the Shuttle. The highlight of the year is anticipated to be the 1981 African Solar Eclipse Rocket, to be launched from the San Marco launch platform off the coast of Kenya. In 1981, we anticipate the accomplishment of the development and the implementation of a logistic and technical consultation services for the Shuttle's self-contained payload containers.

Permanent Positions
(Civil Service)

PLANETARY EXPLORATION 86

The Goddard science activity within the Planetary Exploration program is designed to emphasize the physics of interplanetary space and planetary environments. To this end, Goddard will, in 1981, maintain as strong and viable a research group as is required to carry out this role.

During 1981, Goddard investigators will be actively involved in the development of two instruments, the Neutral Mass Spectrometer and the Photopolarimeter Radiometer for Project Galileo. These instruments will measure chemical composition and the physical properties of clouds in the atmosphere of Jupiter. Goddard will also be involved in the data analysis activity of various instruments on Voyager and Pioneer Venus.

SPACE APPLICATIONS 971

The Goddard Space and Terrestrial Applications program for 1981 spans this Center's broad roles and missions mandate. Included for 1981 are activities in the discipline areas of Resource Observations and Environmental Observations.

Goddard engaged in three major types of activities in these areas: A. Research and Technology; B. Flight Projects; and C. Application Demonstrations. These activities may be characterized as follows:

A. The Space Research and Technology effort in general is directed toward solving major problems in the above mentioned major applications disciplines. It stresses continuity of applied research, from the assessment of these problems, to conceptual instrument design and testing, mission and payload studies, concepts of flight missions, and their final analyses and evaluation after launch. It includes the design and construction of mathematical models to study:

1. The global circulation of this planet's atmosphere for better weather and climate predictions;
2. The dynamics of the earth to provide improved understanding of geodynamics and earthquake processes, and gravity fields;
3. The processes of the oceans such as surface winds, waves, temperature, currents, and circulation to support our weather and climate effort as well as our ocean research program;
4. The earth's renewable and nonrenewable resources for better monitoring, assessment, and management; and
5. The environment of the earth's atmosphere and hydrosphere.

Other examples of efforts of more specific nature include: new instrument development for measuring temperature and pressure profiles in the atmosphere which are essential input parameters for our weather and climate models, user active and passive microwave systems for measuring sea surface temperatures, winds as well as soil moisture essential for water resources modeling and agriculture yield predictions, new instruments for ocean color measurements important for ocean studies and pollution determination, new high precision laser electronic ranging systems to support our Earth and ocean dynamics efforts, new low cost data collection platforms, and low cost global positioning system terminals for civilian application.

B. Application's Flight Project responsibilities at Goddard for 1980 and 1981 include:

1. Operational weather satellite missions for the National Oceanic and Atmospheric Administration (NOAA).
 - a. NOAA-B--scheduled for launch during the 2nd quarter of 1980;
 - b. NOAA-C--satellite integration is expected to be completed in the 1st quarter of 1980 in preparation for 2nd quarter 1981 launch;

- c. NOAA-D--satellite integration is expected to be completed in the 3rd quarter of 1980;
 - d. NOM-E Bus--modifications for incorporation of Search and Rescue components will be completed and delivery of the Bus will occur in the 3rd quarter 1980; and
 - e. Geostationary Operational Environmental Satellite (GOES-E)--to be launched in the 2nd quarter of 1981.
2. Landsat and Nimbus satellites extended operations--will continue to provide remotely sensed resources observations and environmental observations to a worldwide applications research science community.
 3. Landsat-D-fabrication, assembly and test of the Thematic Mapper and Multispectral Scanner System instruments, observatory modules, systems and subsystems will continue, and delivery of all observatory components and subassemblies of the mission system contractor for integration and test of the first space segment will be completed by the end of 1980. Launch is scheduled for late 1981.
 4. Earth Radiation Budget Experiment--monitoring of the design and fabrication of the instrument package and spacecraft are the main areas of emphasis in 1981.
 5. Spinning Solid Upper Stages (SSUS-A)--presently planned to be launched on an early Shuttle flight to launch Intelsat-V.

C. Applications demonstration activities involve the formulation, analysis, and distribution of applications data received from satellites for which Goddard has management responsibility. Such demonstrations concern the use of data from Nimbus-7 spacecraft for the solution of problems concerning pollution, ocean resources and dynamics, and weather and climate. The Heat Capacity Mapping Mission (HCMM) will evaluate **the** utility of thermal measurements from satellites for determining such parameters as soil moisture and rock types inferred from surface temperatures and thermal inertia. Other examples will be the data from Landsat-3 spacecraft. This information will be of use to investigators in the agricultural, forestry, geology, land use, cartography, hydrology, ecology, and oceanography disciplines. A major activity is the transfer of Landsat data applications technology to state and local government organizations, and private industry. Goddard, with the Eastern Regional Sensing Applications Center, has responsibility for remote sensing technology in 17 states.

TECHNOLOGY UTILIZATION 13

At Goddard, Technology Utilization activities are directed toward the application of space technology to public and private sector needs. Foremost among the technology applications projects in 1981 are the following:

1. New technology identification, evaluation, and publication,
2. Dissemination methods and techniques, and
3. Public sector technology applications projects.

SPACE RESEARCH AND TECHNOLOGY 128

The objectives of Goddard in Space Research and Technology program activities are to provide results appropriate to space mission capability enhancement. Past efforts have produced many worthwhile advances in space system capability, reliability, and effectiveness. During 1981, areas of increasing attention include cryogenics for space flight, information systems, sensors, and laser ranging.

TRACKING AND DATA ACQUISITION 538

The Tracking and Data Acquisition program at Goddard is broken into two main areas: operation of the Space-flight Tracking and Data Network (STDN); and mission control, data processing, and computation support for flight projects.

The STDN is operated in direct support of NASA's Earth orbiting scientific and applications satellites and Shuttle/Spacelab programs. In addition, the Network provides services to satellites that are operated by other United States Government Agencies, such as the Department of Defense and the National Oceanic and Atmospheric Administration, by foreign governments, and by commercial companies. Appropriate segments of the Network deliver critical coverage for the launch of spacecraft that are on deep space missions by providing support during portions of the early flight path not visible to NASA's Deep Space Network (DSN).

NASA Communications Network (NASCOM) provides all operational communications required by NASA. Facilities of this Network link the stations of the STDN and will make it possible for the Tracking and Data Relay Satellite System (TDRSS) to operate as a part of the overall tracking and data acquisition complex for which NASA has responsibility.

The TDRSS will provide the satellite relay of Earth orbiting spacecraft data to a single ground station located at White Sands, New Mexico. The system will employ both S- and Ku-band frequencies and will greatly increase coverage capabilities available to Earth orbiting spacecraft. The network will provide the operational interface between the project users and the TDRSS. With the demonstration of a successful TDRSS, a number of STDN ground stations will be closed. However, some of the current stations will be maintained to provide for Shuttle launch and high altitude orbit support that cannot be provided by the TDRSS.

During 1981, the STDN is projecting support for approximately 43 missions including: Space Transportation System flights, High Energy Astronomy Observatories, Fleet Satellite Communications-4, International Sun-Earth Explorers, International Ultraviolet Explorer, Magsat, Solar Maximum Mission, and Stratospheric Aerosol and Gas Experiment.

Mission and Data Operations provide support to flight missions in the categories of mission control, operational computing, and sensor data processing. This includes mission and systems analysis, systems design and implementation, and the operation and maintenance of multimission and dedicated technical facilities to support both Goddard and non-Goddard missions.

During 1981, emphasis will continue to be placed on defining concepts for spacecraft and data autonomy in order to modify designs of flight and ground systems to improve the response, capacity, and effectiveness of the end-to-end data system, as well as the development of system concepts and techniques to provide data to multiple users from multiple data sources.

In the area of mission control, work will continue on the first Payload Operations Control Center Network (POCCNET) cluster to allow the reuse of standard components and designs in order to share expensive resources among a large number of missions.

For operational computing two major efforts will be continued. The first will be to put in place a new metric data handling system in order to provide an improved central point of metric data reception from the STDN; and, the second is to size the computational requirements for the Shuttle era and provide a new computing capability for flight dynamics, including attitude computations, and command management.

Emphasis will be placed on end-to-end data concepts; and, in addition, a major effort will be required to develop and implement a new capability to process and distribute Spacelab payload data.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 751

Center Management and Operations Support is defined as that support or services being provided to all Goddard organizations which cannot be directly identified to a benefiting program or project. The civil service personnel involved are:

Director and Staff

The Center Director, Deputy Director and immediate staff, Staff Organizations, e.g., Legal, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs, and Safety.

Management Support

Includes a wide range of activities generally categorized as activities of a general and administrative nature which are required to operate and maintain the installation. Specific functions include resources and budget management, program control, contracting and procurement, personnel management, property management, financial management, and resource control and management information systems and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are: maintenance and operation of all buildings and facilities, data processing and computer support, reliability and quality assurance, Centerwide security and protection, fire protection, custodial services, logistics support including transportation, supplies, medical care of employees, and photographic and graphic support.

RESOURCE REQUIREMENTS BY FUNCTION

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 Budget <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>107,900</u>	<u>110,150</u>	<u>115,011</u>	<u>115,638</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	96,912	98,441	102,800	102,837
b. Other than full time permanent positions	772	776	935	965
c. Overtime and other compensation	<u>801</u>	<u>866</u>	<u>897</u>	<u>897</u>
Subtotal, Compensation	98,485	100,083	104,632	104,699
2. <u>Benefits</u>	<u>8,712</u>	<u>9,165</u>	<u>9,394</u>	<u>9,361</u>
Subtotal, Compensation and Benefits	<u>107,197</u>	<u>109,248</u>	<u>114,026</u>	<u>114,060</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	146	208	163	163
2. Personnel training	<u>557</u>	<u>694</u>	<u>822</u>	<u>1,415</u>
Subtotal, Supporting Costs	<u>703</u>	<u>902</u>	<u>985</u>	<u>1,578</u>
Total, Personnel and Related Costs	<u>107,900</u>	<u>110,150</u>	<u>115,011</u>	<u>115,638</u>

Explanation of Fund Requirements

	1979 <u>Actual</u>	1980		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
A. <u>Compensation and Benefits</u>	107,197	109,248	114,026	114,060
1. <u>Compensation</u>	98,485	100,083	104,632	104,699
a. Permanent positions	96,912	98,441	102,800	102,837

The estimate for 1981 will support 3,440 permanent positions. The increase from the 1980 budget estimate to the 1980 current estimate is due to the October 1979 pay increase.

Basis of Cost for Permanent Positions

The estimate for permanent compensation (starting from prior year cost) is based upon the position structure at the start of the year, as modified by the addition of new positions and an abolishment of existing positions, within grade advances, career development, and the October 1979 pay increase. After these modifications, the year-end position structure is established and the cost effect for the year is calculated based on the estimated period that these modifications are in effect. The cost of permanent positions in 1981 will be \$102,837,000, an increase of \$37,000 over 1980. The increase from 1980 results from the following:

Cost of permanent positions in 1980	102,800
Cost increases in 1981	+3,012
Within grade and career advances:	
Full year effect of 1980 actions.....	+1,124
Partial year effect of 1981 actions....	+1,289
Full year effect of 1980 pay increases.....	+55
Change in reimbursable....	+544
Cost decreases in 1981	-2,975
Turnover savings and abolished positions:	
Full year effect of 1980 actions	-1,463
Partial year effect of 1981 actions	-1,158
One less paid day in 1981	-354
Cost of permanent positions in 1981	<u>102,837</u>

	1979 <u>Actual</u>	<u>1980</u>		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
b. Other than full time permanent positions				
1. cost	772	776	935	965
2. Workyears	81	79	91	95

The 1981 plan includes 95 workyears which will support the following programs:

Distribution of Other than Full Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training	33
Summer employment	5
Opportunity programs	21
Other temporary employment	<u>36</u>
Total	<u>95</u>

The workyear increases from the 1980 budget estimate to the 1980 current estimate reflect a build-up in the clerical work study program, the continuation of the part-time employment program and the institution of the White House Research Apprenticeships program. The 1981 budget estimate reflects the full year effect of the October 1979 pay increase.

c. Overtime and other compensation	801	866	897	897
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Overtime at Goddard is required to meet peak operational requirements where additional workhours are essential, generally culminating in the launch of a manned or automated spacecreat. Some of the areas involved are fabrication, experimentation, testing, launching and tracking of the spacecraft. The increase from the 1980 budget estimate to the 1980 current estimate reflects the October 1979 pay increase.

2. <u>Benefits</u>	<u>8,712</u>	<u>9,165</u>	<u>9,394</u>	<u>9,361</u>
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1979 <u>Actual</u>	1980		1981
	Budget	Current	Budget
	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
	(Thousands of Dollars)		

The following table indicates the cost of personnel benefits by the major categories:

Civil Service Retirement Fund	6,779	6,990	7,298	7,274
Employees life insurance	229	388	245	245
Employees health insurance	1,436	1,657	1,640	1,691
Workman's compensation	134	92	186	126
FICA..	20	25	25	25
Severence pay.....	15	---	---	---
Other benefits.....	<u>99</u>	<u>13</u>	<u>---</u>	<u>---</u>
Total.....	<u>8,712</u>	<u>9,165</u>	<u>9,394</u>	<u>9,361</u>

The increase from the 1980 budget estimate to the 1980 current estimate reflects the October 1979 pay increase. Workmen's compensation costs are based on the Department of Labor billings for 1980 and 1981.

B. <u>Supporting Costs</u>	<u>703</u>	<u>902</u>	<u>985</u>	<u>1,578</u>
1. Transfer of personnel	146	208	163	163

The category includes the reimbursement to employees for movements of household goods to the employee's new duty station, and other relocation expenses.

2. Personnel training	557	694	822	1,415
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The personnel training costs are based on continuation of current training programs and the need to reorient skills of employees into areas compatible with the direction of the current space program and Goddard's role in the program. The increases in the 1980 current estimate and 1981 are necessary to fund training associated with the Civil Service Reform Act and the Tracking and Data reorganization.

	1979 Actual	1980 Budget Estimate Current Estimate (Thousands of Dollars)		1981 Budget Estimate
II. <u>TRAVEL</u>	<u>2,384</u>	<u>2,672</u>	<u>2,542</u>	<u>2,712</u>
<u>Summary of Fund Requirements</u>				
A. Program Travel	2,025	2,285	2,168	2,304
B. Scientific and Technical Development Travel	219	247	239	266
C. Management and Operations Travel	<u>140</u>	<u>140</u>	<u>135</u>	<u>142</u>
Total, Travel	<u>2,384</u>	<u>2,672</u>	<u>2,542</u>	<u>2,712</u>

Explanation of Fund Requirements

A. Program Travel	<u>2,025</u>	<u>2,285</u>	<u>2,168</u>	<u>2,304</u>
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Program travel is essential to the accomplishment of the Center's mission, particularly with regard to the Physics and Astronomy, Space and Terrestrial Applications, Tracking and Data Acquisition, and Space Transportation Systems programs. In these areas, efforts will be devoted to performing applications research, developing complex satellites and launch systems, managing data processing systems, and creating scientific instruments for further research. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The increase in the 1981 estimate over the 1980 current estimate is due to increased requirements associated with such programs as Space Telescope and the Cosmic Background Explorer.

B. Scientific and Technical Development Travel	<u>219</u>	<u>247</u>	<u>239</u>	<u>266</u>
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Scientific and technical development travel permits employees to participate in meeting and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside GSFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. Space Science programs are the primary users of travel in this area. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The 1981 estimate provides for the same level of travel activity as in 1980.

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u>	<u>140</u>	<u>140</u>	<u>135</u>	<u>142</u>

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities, travel of the Center's top management to other NASA Centers, and local transportation. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The 1981 estimate provides for the same level of travel activity as in 1980.

111. <u>FACILITIES SERVICES</u>	<u>9,574</u>	<u>10,288</u>	<u>10,547</u>	<u>11,816</u>
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Goddard Space Flight Center (GSFC) is located on a 554-acre main site and on a 640-acre remote site area with a complex of laboratory and office-type buildings as well as test facilities. This complex encompasses 2,266,899 gross square feet of building space including 17 major buildings. Also included are seven major technical facilities. This physical plant supports an average daily on-Center population of 5,800 to 6,100 personnel. Many of the test facilities are utilized on schedules involving more than one shift and during off-peak hours.

Summary of Fund Requirements

A. <u>Rental of Real Property</u>	<u>677</u>	<u>647</u>	<u>677</u>	<u>966</u>
B. <u>Maintenance and Related Services</u>				
1. Facilities	<u>1,966</u>	<u>1,504</u>	<u>1,470</u>	<u>1,427</u>
2. Equipment	<u>65</u>	<u>16</u>	<u>15</u>	<u>15</u>
Subtotal	<u>2,031</u>	<u>1,520</u>	<u>1,485</u>	<u>1,442</u>
C. <u>Custodial Services</u>	<u>1,713</u>	<u>1,972</u>	<u>1,722</u>	<u>2,121</u>
D. <u>Utilities Services</u>	<u>5,153</u>	<u>6,149</u>	<u>6,663</u>	<u>7,287</u>
Total, Facilities Services	<u>9,574</u>	<u>10,288</u>	<u>10,547</u>	<u>11,816</u>

Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	<u>Budget</u> <u>Estimate</u>
A. <u>Rental of Real Property</u>	<u>677</u>	<u>647</u>	<u>677</u>	<u>966</u>

This provides space for personnel at certain tracking stations and the Goddard Institute for Space Studies (GISS) in New York City, as well as storage and warehouse space for equipment, supplies and materials. The area requirements in 1981 are the same as those rented in 1980. The increase from the 1980 budget estimate to the 1980 current estimate is due to an anticipated reduction of rental space which did not materialize. The increase in 1981 is due to GSA's reevaluation of rental rates.

B. <u>Maintenance and Related Services</u>	<u>2,031</u>	<u>1,520</u>	<u>1,485</u>	<u>1,442</u>
1. <u>Facilities</u>	<u>1,966</u>	<u>1,504</u>	<u>1,470</u>	<u>1,427</u>

The 1979 actuals included maintenance items deferred from 1978, lamp replacement in offices to achieve energy savings, rehabilitation of air-conditioning system to achieve energy reduction, and other miscellaneous items.

This activity provides in 1981 for the continuation of the same level of effort as in 1980. The major services included are:

a. <u>Maintenance and operation</u>	438
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These funds provide general buildings maintenance including painting, inspection, and mechanical and electrical maintenance.

b. <u>Ground maintenance</u>	160
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Provides for mowing, cultivation, mulching, fertilizing and care of trees and shrubs.

c. <u>Supplies and facilities equipment</u>	385
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Included in this category are chemicals, building materials, electrical and electronics materials, general maintenance and operating materials, metals, pipes, valve, and fittings.

	<u>1979</u> <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1981</u> Budget <u>Estimate</u>
d. Routine facilities work				444
Included in this activity is support for rehabilitation and modification of facilities, office alteration and safety upgrading.				
2. Equipment	65	16	15	15
Provides for maintenance of and equipment for the onsite radio communications network.				
C. <u>Custodial Services</u>	<u>1,713</u>	<u>1,972</u>	<u>1,722</u>	<u>2,121</u>
This activity involves a total of 114 support contractor workyears of effort at GSFC. The decrease in the the 1980 current estimate from the 1980 budget estimate reflects some rephasing of funding plans as well as a reduction of three support contractor workyears of effort. The 1981 estimate reflects full year funding of essentially the same level of services as in 1980.				
1. Janitorial services (74 workyears of effort)				1,285
This activity is applicable to about 2.2 million square feet of area, and includes washing and relamping of light fixtures, office cleaning, minor laundry services, and trash removal.				
2. Security guard services (40 workyears of effort)				836
This activity includes badging of all onsite personnel and visitors, vehicle identification, and protection of all Government facilities and equipment including the GISS in New York City.				
D. <u>Utilities Service</u>	5,153	<u>6,149</u>	<u>6,663</u>	<u>7,287</u>
The estimate provides for operation and maintenance of the utility plant and distribution systems as well as the purchase of utility services, and supplies, materials and equipment required for the maintenance of these systems. Electricity is purchased from the Potomac Electric and Power Company, natural gas from Washington Gas Light Company and fuel oil from a local supplier. Water and sewage is provided by the Washington Suburban Sanitary Commission. The increases from the 1980 budget estimate to the 1980 current estimate and from the 1980 current estimate to the 1981 estimate are due to utility rate and negotiated support service contract wage increases. The purchased utilities are as follows:				

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Electricity (92,780 MW/hrs)				4,753
2. Natural Gas (173,700 K cu. ft.)				685
3. Fuel Oil (700,000 gals)				363
4. Water and Sewage				345
<hr/>				
IV. <u>TECHNICAL SERVICES</u>	<u>2,599</u>	<u>2,325</u>	<u>2,449</u>	<u>3,076</u>
<u>Summary of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>				
1. Equipment	493	280	36	626
2. Operations	<u>1,106</u>	<u>1,070</u>	<u>1,257</u>	<u>1,308</u>
Subtotal	<u>1,599</u>	<u>1,350</u>	<u>1,293</u>	<u>1,936</u>
B. <u>Scientific and Technical Information</u>				
1. Library	606	576	718	719
2. Education and Information	<u>181</u>	<u>217</u>	<u>206</u>	<u>206</u>
Subtotal	<u>787</u>	<u>793</u>	<u>924</u>	<u>925</u>
C. <u>Shop Support and Services</u>	<u>213</u>	<u>182</u>	<u>232</u>	<u>215</u>
Total, Technical Services..	<u>2,599</u>	<u>2,325</u>	<u>2,449</u>	<u>3,076</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>	<u>1,599</u>	<u>1,350</u>	<u>1,293</u>	<u>1,936</u>

This funding provides accounting and management information to satisfy requirements of NASA and GSFC management. Included is support of GSFC business data functions.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
1. Equipment	493	280	36	628

The 1979 costs included miscellaneous purchases of equipment such as disc drivers for use with the newly purchased IBM 360/50 computer. The maintenance costs of all GSFC-owned administrative ADP equipment and the lease costs of all leased administrative ADP hardware are included in this estimate. Leased equipment includes Xerox 1200 printer, various terminals, and other peripheral equipment. Maintenance services are provided for the IBM 360/50 (main business computer), memory disc drives, terminals, and associated equipment. The decrease from the 1980 budget estimate to the 1980 current estimate is due to purchases made in 1979 that were originally planned for 1980. The 1981 estimate includes an administrative computer.

2. Operations	1,106	1,070	1,257	1,308
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The systems supported include Institutional Management, Finance and Accounting, Procurement and Personnel Management. The increase in 1980 from the budget estimate to the current estimate, and the increase from 1980 current estimate to 1981 is due to support contractor wage increases. Computer programming, key-punching operators, and other support personnel provide for 36 workyears of effort. Supplies, materials and software programs are included as operational costs for provision of administrative ADP information.

B. <u>Scientific and Technical Information</u>	<u>787</u>	<u>793</u>	<u>924</u>	<u>925</u>
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These funds provide for the operation of a technical library at GSFC, a public affairs educational and informational program, and support to the Center in the provision of various scientific and technical information services.

1. Library	606	576	718	719
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Cataloging, reference, acquisition, translating services, and distribution of books and publications in the operation of the GSFC library are funded in this estimate. This includes over 65,000 books, 45,000 journals, plus almost one million microfiche copies of aerospace documents. The increase from the 1980 budget estimate to the 1980 current estimate reflects increased costs for periodicals.

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)-		1981 <u>Budget Estimate</u>
2. Education and Information	181	217	206	206

This estimate includes funds for exhibit management and refurbishment, spacemobile operation, demonstration models, workshops and symposia, and educational and information materials.

C. <u>Shop Support and Services</u>	<u>213</u>	<u>182</u>	<u>232</u>	<u>215</u>
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Support is provided in the areas of safety, photo services, graphics, and publications. Fire protection system maintenance and related supplies and equipment; film and print processing, photographic supplies and repair of photographic equipment; art work services and related supply and equipment costs; and materials and equipment maintenance for compilation of documents comprise this category. The increase from the 1980 budget estimate to the 1980 current estimate reflects increased requirements for photo and graphic services.

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>5,453</u>	<u>5,762</u>	<u>5,256</u>	<u>6,093</u>
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Summary of Fund Requirements

A. Administrative Communications	2,251	2,299	2,284	2,284
B. Printing and Reproduction	335	316	309	256
C. Transportation	1,268	1,845	1,237	1,978
D. Installation Common Services	<u>1,599</u>	<u>1,302</u>	<u>1,426</u>	<u>1,575</u>
Total, Management and Operations	<u>5,453</u>	<u>5,762</u>	<u>5,256</u>	<u>6,093</u>

Explanation of Fund Requirements

	1979 <u>Actual</u>	1980		1981
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
A. <u>Administrative Communications</u>	<u>2,251</u>	<u>2,299</u>	<u>2,284</u>	<u>2,284</u>
Provides for local telephone service, long distance telephone service, and other non-telephone communications.				
1. Local telephone services				1,378
Covers 3,990 PBX internal lines and 5,800 telephone instruments at Goddard; there are 10 tielines for Baltimore-area communications. Two hundred and fifty centrex lines are used for computer data operations.				
2. Long distance telephone service				831
a. Federal Telecommunications System use will approximate 869,000 calls in 1981.				
b. Tolls or commercial long distance costs are included.				
3. Other communication services				75
a. Teletype costs including the CSA Automatic Records System (ARS).				
b. Also included is a United Press International Wire Service for the Public Affairs Office.				
B. <u>Printing and Reproduction</u>	<u>335</u>	<u>316</u>	<u>309</u>	<u>256</u>

This estimate provides the funding for an onsite printing plant operated by Goddard personnel. This printing plant produces approximately 17,000,000 units of printing each year. In addition to this onsite printing plant, Goddard must also purchase from private firms under Government Printing Office contract about 30,000,000 units of printing each year. This purchased printing is a combination of an overflow requirement that cannot be handled because of the onsite workload and items that cannot be handled with the onsite equipment. Types of printing accomplished by offsite private firms are multiple-copy forms, multi-color work, and forms for computer use. The 1981 estimate reflects a constrained level of activity.

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1981 <u>Budget</u> <u>Estimate</u>
C. <u>Transportation</u>	<u>1,268</u>	<u>1,845</u>	<u>1,237</u>	<u>1,978</u>

This estimate includes 50 workyears of support contractor effort for the operation of Center transportation and storage areas, and other miscellaneous services. Also included are supplies and equipment for vehicle maintenance, gasoline, contracted services for vehicle maintenance, and special vehicle rental. The decrease from 1980 budget estimate to the 1980 current estimate reflects some rephasing of support contract funding plans. The 1981 increase is due to an anticipated increase in support contractor wage rates.

1. Contractor support provides the following services:

- a. Operation of Transportation Center--32 workyears for drivers, dispatchers, supervisory personnel; provide pickup and delivery of purchased items and stock items, mail delivery, shuttle transportation, issuance of motor pool vehicles.
- b. Packing and crating--one workyear for preparing shipments.
- c. Rigging--three workyears for rigging equipment for relocation on the Center for shipment elsewhere.
- d. Tape storage--six workyears to operate central magnetic tape depository.
- e. Storage and warehousing--seven workyears to operate receiving areas for supplies, stock issuance, and warehousing and storage function.
- f. Moving and hauling--one workyear for moving equipment and furniture on emergency basis.

D. <u>Installation Common Services</u>	<u>1,599</u>	<u>1,302</u>	<u>1,426</u>	<u>1,575</u>
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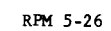
This activity supports Center management and staff activities, provides medical services, and covers various installation support services. The increase in 1980 from the budget estimate to the current estimate is due to increases in postage and office furniture and for emergency preparedness which was not included in the 1980 budget estimate. The increase in 1981 is due to wage rate increases.

1. Center management and staff	284
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Includes patent searches and applications; stenographic services, handbook revisions, Equal Opportunity programs; and general administrative supplies, materials, equipment, and equipment maintenance (microfilm, copiers, special typewriters) for staff offices.

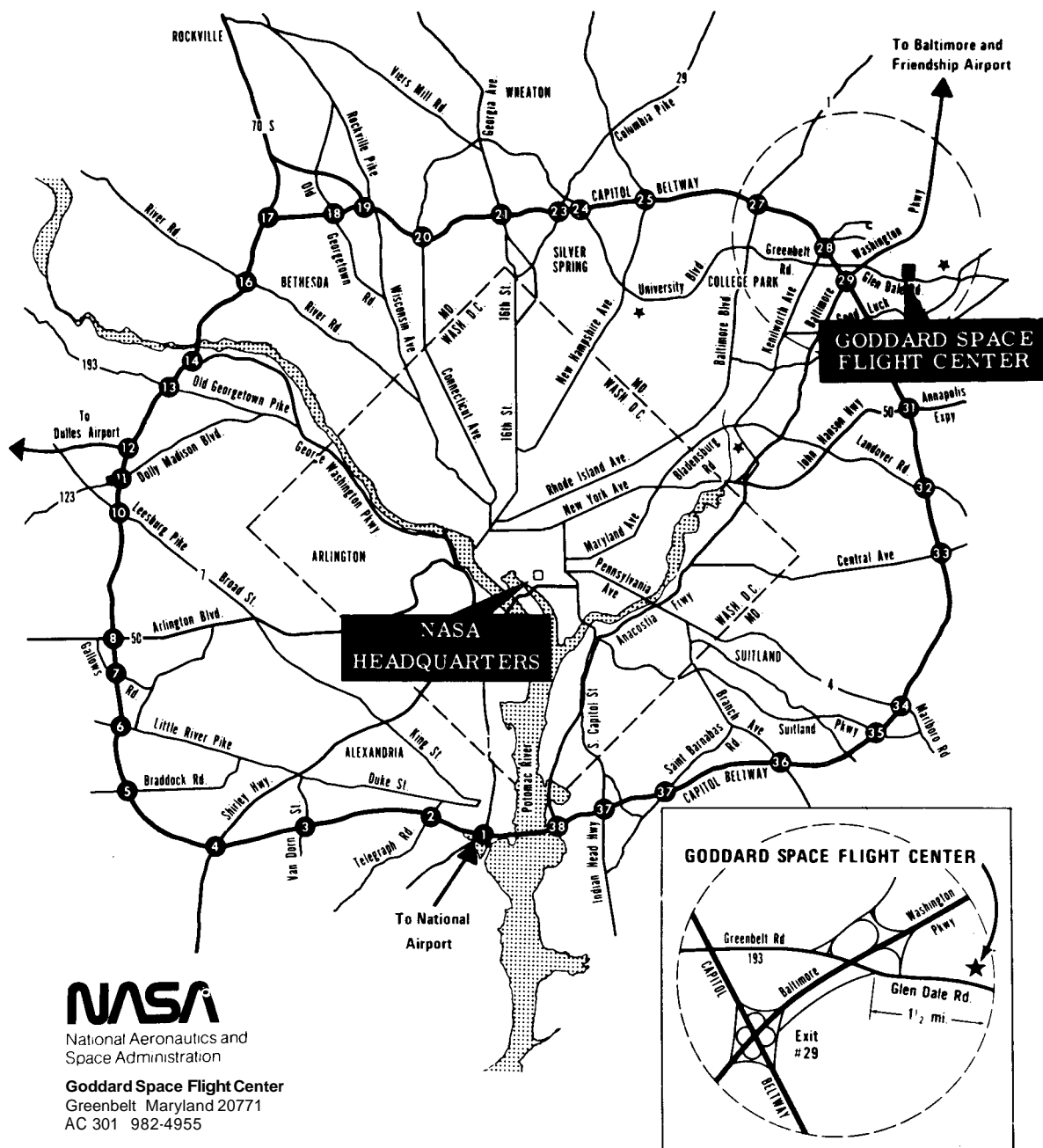
	<u>1979</u> <u>Actual</u>	<u>1980</u> <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>1981</u> <u>Budget</u> <u>Estimate</u>
2. Medical Services				695
Provides support in Occupational Medicine and Environmental Health. Eighteen support contractor workyears are required for onsite support.				
a. Occupational medicine				496
This activity consists of operation of the Goddard onsite Health Unit and medical services for the Goddard Institute for Space Studies (GISS) employees in New York. Twelve workyears provide emergency care onsite, annual physical exams for Goddard employees, fitness programs, immunizations and counseling. Annual physical exams are provided for approximately 3,440 employees at the Center. The necessary supplies, materials, and equipment for operation of the Health Unit are included.				
b. Environmental health				199
Environmental health consists of industrial hygiene and an environmental health lab at a total of six workyears for detection and correction of health hazards. Necessary supplies, materials and equipment are included.				
3. Installation support services				596
This estimate includes all administrative support items not specifically identified elsewhere. Among these are the purchase of office furniture and operating supplies issued from stock; maintenance of all Center labor-saving devices; materials for mailroom and warehouse operation; and postage costs.				
a. Office supplies				195
General office supplies, furniture, and operating supplies for warehouse and mailroom, such as pallets and gas cylinders are included in this estimate.				
b. Maintenance of general administrative equipment..				109
This funding provides maintenance of copiers, time stamps, electronic calculators, electric typewriters, calculators, and adding machines; as well as cylinder and electric file maintenance.				
c. Postage				292

4 1979



GODDARD SPACE FLIGHT CENTER FISCAL YEAR 1981 ESTIMATES AREA MAP

RPM 5-27

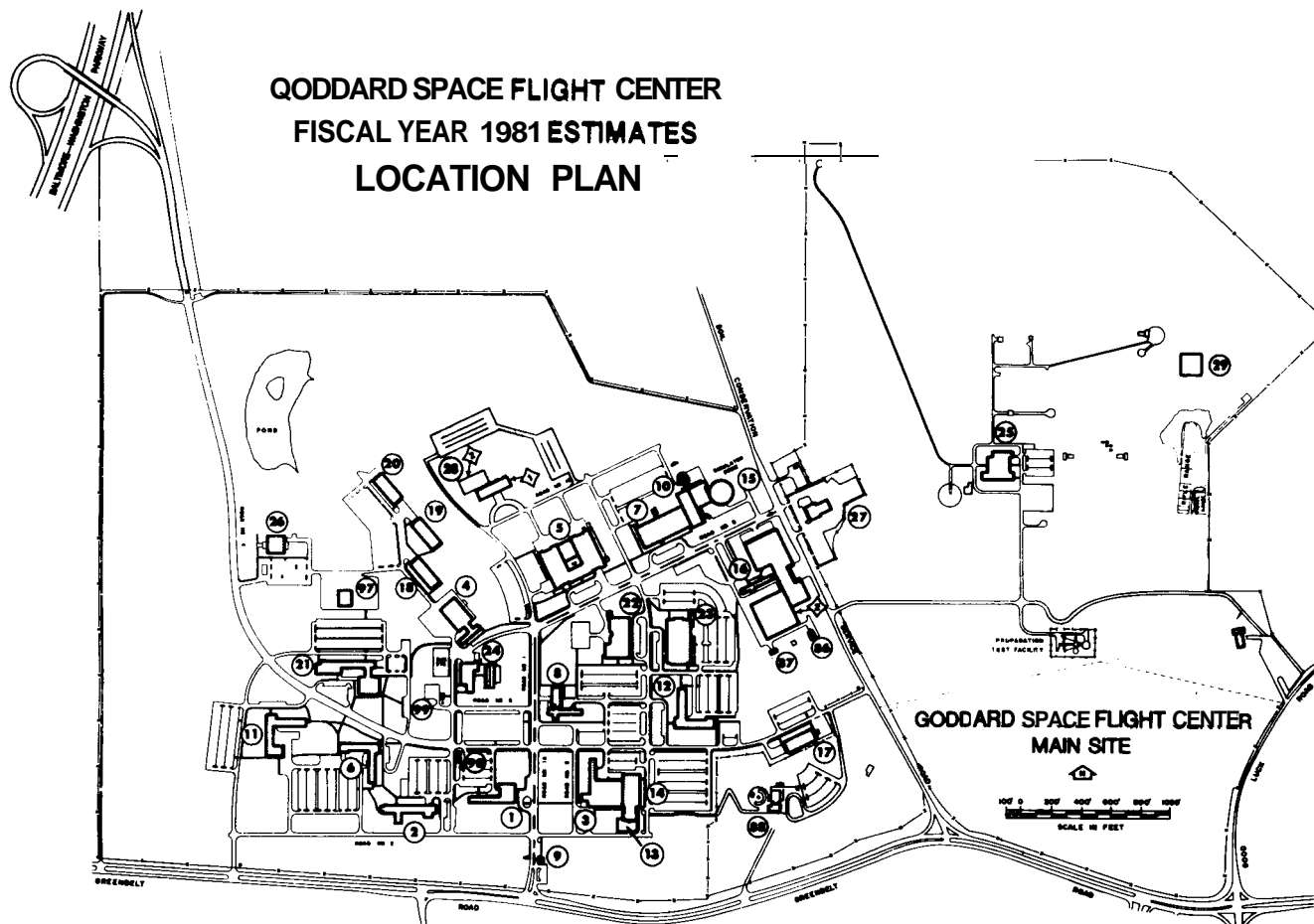


NASA

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt Maryland 20771
AC 301 982-4955

**QODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1981 ESTIMATES
LOCATION PLAN**



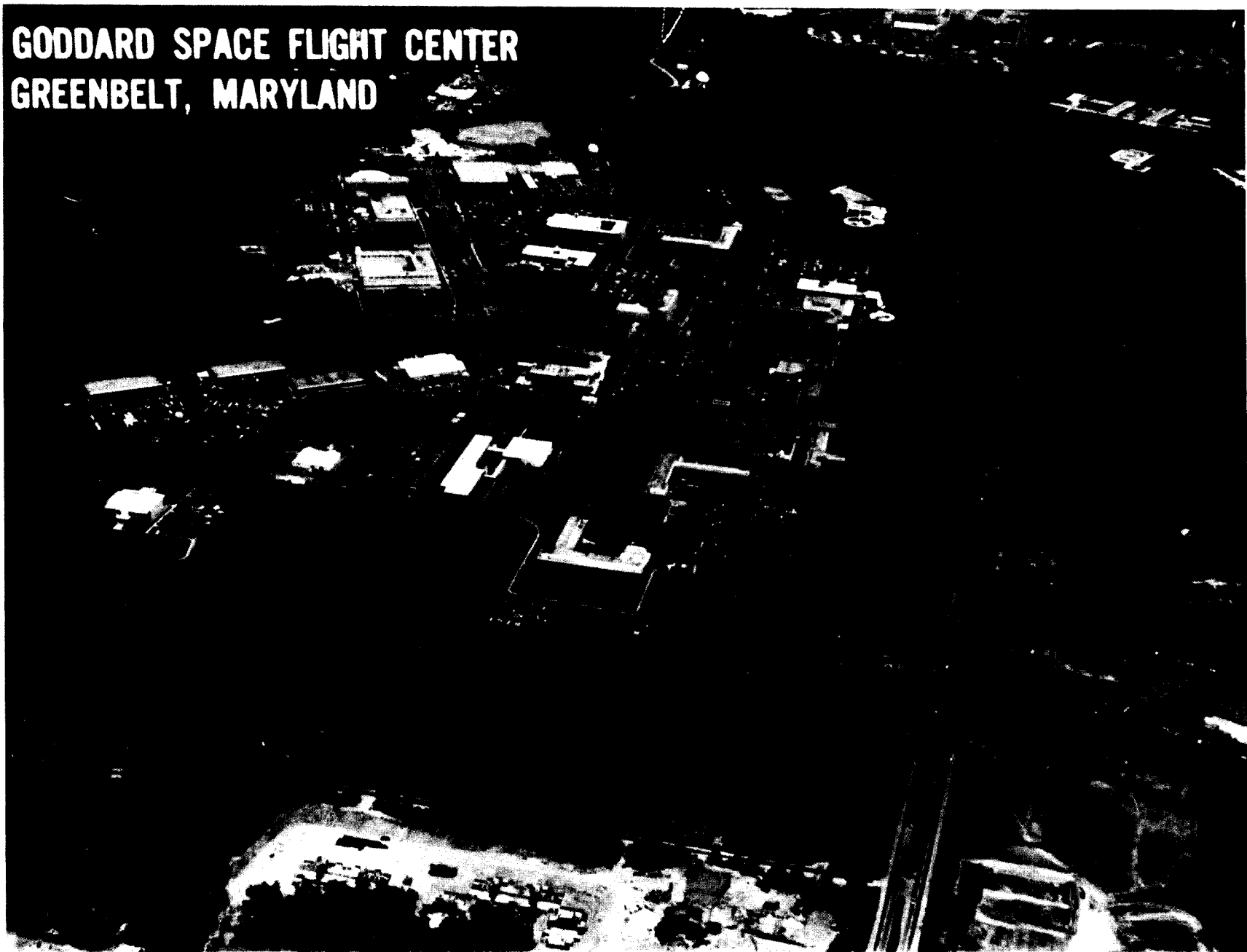
- 1 SPACE PROJECTS BUILDING
- 2 RESEARCH PROJECTS LABORATORY
- 3 CENTRAL FLIGHT CONTROL 6 RANGE OPERATIONS BUILDING
- 4 GENERAL PURPOSE FACILITY BUILDING
- 5 INSTRUMENT CONSTRUCTION & INSTALLATION LABORATORY
- 8 SPACE SCIENCES LABORATORY
- 7 PAYLOAD TESTING FACILITY
- 8 SATELLITE SYSTEMS BUILDING
- 9 MAIN GATE HOUSE
- 10 ENVIRONMENTAL TESTING LABORATORY
- 11 APPLIED SCIENCES LABORATORY
- 12 TRACKING 6 TELEMETRY LABORATORY
- 13 NETWORK CONTROL CENTER FACILITY
- 14 SPACECRAFT OPERATIONS FACILITY
- 15 LAUNCH PHASE SIMULATOR
- 18 DEVELOPMENT OPERATIONS BUILDING
- 17 MULTI-PURPOSE BUILDING
- 18 BUSINESS OPERATIONS BUILDING
- 19 MULTI-PURPOSE BUILDING
- 20 GEOCHEMISTRY BUILDING
- 21 METEOROLOGICAL SYSTEMS DEVELOPMENT LABORATORY
- 22 MECHANICAL TEST FACILITY 6 QUALITY ASSURANCE LABORATORY
- 23 DATA INTERPRETATION LABORATORY
- 24 CENTRAL HEATING 6 REFRIGERATION PLANT
- 26 NETWORK TRAINING 6 TEST FACILITY
- 26 NASA SPACE SCIENCE DATA CENTER
- 27 MOBILE EQUIPMENT SUPPORT FACILITY
- 28 TECHNICAL PROCESSING FACILITY
- 28 FREQUENCY STANDARD AND TEST FACILITY
- 86 DAY CARE CENTER BUILDING
- 87 GAS CYLINDER STORAGE BUILDING
- 88 VISITOR INFORMATION FACILITY
- 97 PLANT MAINTENANCE SUPPORT FACILITY
- 98 GEWA STORE
- 99 NASA CAREER DEVELOPMENT CENTER



TECHNICAL PROCESSING FACILITY - FY78 PROJECT

MODIFICATIONS & ADDITIONS FOR LOGISTIC & SUPPLY FUNCTIONS - FY79 PROJECT

**GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND**



WALLOPS
FLIGHT CENTER



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

WALLOPS FLIGHT CENTER

TION

Wallops Flight Center (WFC) includes three separate areas on the Atlantic Coast of Virginia's Eastern Shore: the main base, the Wallops Island launching site, and the Wallops mainland site. The administrative offices range control center, support shops, and main telemetry buildings are located on the main base. Wallops Island is about seven miles southeast of the main base and is connected to the mainland by a causeway and bridge. The island is about five miles long and one-half mile wide at its widest point. Located on the island are rocket storage buildings, blockhouses, assembly shops and launch sites. The Wallops mainland is a one-half mile strip west of the island which houses the radar and optical tracking sites.

Wallops Flight Center, totalling 6,166 acres, consists of 1,833 acres on the main base, 3,095 acres on Wallops Island, 108 acres on the mainland tracking site, and 1,140 acres of marsh land. The total capital investment, including fixed assets in progress and contractor-held facilities at various locations as of September 30, 1979, was \$141,887,000.

CENTER ROLES AND MISSIONS

Wallops Flight Center prepares, assembles, launches and tracks space vehicles and acquires scientific information from them. Wallops also has developed, maintains, and operates a research airport in support of NASA's aeronautical research programs which include projects associated with airport-aircraft interface, air traffic control, avionics systems technology, final approach and landing systems, airport configuration, high speed turn-off techniques, airport environmental studies, noise reduction technology, and general aviation research focused on aircraft spin characteristics, cross-wind landings, pilot performance, and procedures and aides at uncontrolled airports and airspace. Its facilities are utilized by the scientists and engineers from the laboratories and research centers of NASA, other governmental agencies, colleges and universities, and the worldwide scientific community. Center personnel assist these scientific research teams with their projects and develop, as necessary, special types of instrumentation and equipment to complete the mission. The principal and supporting roles are:

PRINCIPAL

Sounding Rocket Development, Procurement and Operations • developing and procuring sounding rockets and carrying out all phases of operations, from mission and flight planning to landing and recovery. Payload carrier development, telemetry, experiment management support to other institutions, launch operations, and tracking and data acquisition are included.

Balloon Program • managing, monitoring, scheduling, and analyzing balloon activities conducted for NASA, the Office of Naval Research and the National Science Foundation.

SUPPORTING

Sounding Rocket Payload Carrier Development and Experiment Management Support • providing support in the applications disciplines of weather and climate.

Aeronautical Flight Test Support • providing flight test support for Langley Research Center's aeronautical flight test programs, including tracking and data acquisition.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	10,476	10,749	11,361	11,440
II. Travel.....	276	406	325	347
III. Facilities Services.....	3,317	3,398	3,586	3,771
IV. Technical Services.....	575	524	537	963
V. Management and Operations.....	<u>1,162</u>	<u>1,253</u>	<u>1,276</u>	<u>2,456</u>
Total, fund requirements.....	<u>15,806</u>	<u>16,330</u>	<u>17,085</u>	<u>18,977</u>

Distribution of Permanent Positions by Program

	<u>1979</u> <u>Actual</u>	<u>1980</u> Budget <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>1981</u> Budget <u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportations Systems</u>	<u>6</u>	<u>-</u>	<u>4</u>	<u>4</u>
Space flight operations.....	2	-	2	2
Expendable launch vehicles.....	4	-	2	2
<u>Space Science</u>	<u>73</u>	<u>67</u>	<u>72</u>	<u>72</u>
Physics and astronomy.....	73	67	72	72
<u>Space and Terrestrial Applications</u>	<u>51</u>	<u>56</u>	<u>55</u>	<u>55</u>
Space applications.....	47	55	54	54
Technology utilization.....	4	1	1	1
<u>Aeronautics and Space Technology</u>	<u>34</u>	<u>34</u>	<u>34</u>	<u>34</u>
Aeronautical research and technology.....	34	34	34	34
<u>Space Tracking and Data Systems</u>	<u>105</u>	<u>108</u>	<u>105</u>	<u>105</u>
Tracking and data acquisition.....	<u>105</u>	<u>108</u>	<u>105</u>	<u>105</u>
Subtotal, direct positions.....	269	265	270	270
<u>Center Management and Operations Support Positions</u>	<u>129</u>	<u>130</u>	<u>125</u>	<u>125</u>
Total, permanent positions.....	<u>398</u>	<u>395</u>	<u>395</u>	<u>395</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE FLIGHT OPERATIONS 2

In 1981, the civil service personnel will provide mission and range safety support for Space Shuttle launches. Wallops Flight Center (WFC) tracking activities will also support Space Shuttle missions during the orbital phase.

EXPENDABLE LAUNCH VEHICLES 2

In 1981, Wallops civil service personnel will receive, inspect and store the Scout expendable launch vehicle and maintain the launch facility for future Scout missions.

PHYSICS AND ASTRONOMY 72

Sounding Rocket Program

The objective of this program is to support space research, using low cost sounding rockets, in the fields of Solar Physics, Galactic Astronomy, Fields and Particles, and Ionospheric Physics. Wallops Flight Center provides flight systems support, launch range support, and support to experiments utilizing sounding rockets.

In 1981, the Wallops Launch Range will provide launch activities and ground instrumentation/support of the launches at WFC and at the Poker Flats Research Range near Fairbanks, Alaska, plus expedition type support to other areas. The WFC launch range is equipped with launchers capable of handling sounding rockets of all sizes. The Poker Flats Research Range, jointly supported by WFC and the Defense Nuclear Agency, has limited capability, although its facilities can be supplemented by the mobile equipment from WFC.

Balloon Program

The objective of this program is to support space research, using low cost balloon platforms, in the fields of Solar Physics, Galactic Astronomy, Stratospheric Composition and Aeronomy.

In 1981, WFC will provide ground instrumentation support, technical, and flight hardware support to experimenters in the balloon program.

The majority of the flights are conducted from the National Scientific Balloon Facility site at Palestine, Texas, or the United States Air Force site at Holloman, New Mexico; however, some flights are supported from remote sites in the northern United States, Canada, Alaska, Australia, New Zealand, Argentina and Brazil.

<u>SPACE APPLICATIONS</u>	54
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Environmental Observations

In 1981, the WFC civil service personnel will continue to conduct the Meteorological Rocket Network project. The objectives of this project are:

1. To investigate the processes which characterize the physical state of the strato-mesosphere region of the atmosphere and to determine interactions within this layer of the atmosphere and with the troposphere.
2. To provide data for climatology of the upper atmosphere.
3. To provide in-situ measurement data which are used to calibrate satellite remote sensors.

Through the Meteorological Rocket Networks project, WFC manages NASA's participation in the Cooperative Meteorological Rocket Network (CMRN), the Experimental Inter-American Meteorological Rocket Network (EXAMETNET) and the Eastern-Western Hemisphere Meteorological Rocket Network.

In Ocean Processes, where the primary emphasis is being placed, investigations in the broad areas of sea state measurement, surface currents, ocean topographical mapping, and their supporting ground truth, are in progress.

In 1981, the WFC civil service personnel will be involved in investigating the feasibility of determining ocean surface currents from satellites and aircraft measurement of the local surface wave structure; investigating the "sea state bias effect" in satellite altimetry to develop methods of correcting the error; determining the mean sea surface of geoid; evaluating and determining the inadequacies of existing predictive and descriptive synoptic ocean circulation models and investigating the impact of utilizing synoptic altimeter data as input to the models; and developing techniques of using altimeter pulse wave from data for the determination of sea state.

Balloon Program

The objective of this program is to support the Space and Terrestrial Applications program using low cost balloon platforms in the field of stratospheric composition, meteorology and aeronomy.

TECHNOLOGY UTILIZATION..... 1

In 1981, the Technology Utilization program at WFC involves (1) expediting application of new technology, (2) encouraging the use of NASA Technology in other sectors, and (3) understanding more fully the technology transfer process and its impact.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 34

In 1981, the WFC airport will be involved in conducting research tests of various aircraft in the terminal area operating environment. Flight studies will be made of new approach and landing procedures utilizing the latest in guidance equipment and techniques, pilot information displays, terminal area navigation, and tests of other systems leading to automatic landing of aircraft. One runway has been modified to study the effect of runway grooving as a means of controlling aircraft hydroplaning on wet or slush-covered runways. Studies of automotive hydroplaning have also been conducted using this runway. The data acquired from the aircraft and automotive tests will ultimately assist in the development of safer, more flexible transportation systems.

TRACKING AND DATA ACQUISITION..... 105

Tracking and data acquisition activities provide both fixed and mobile equipment for tracking, data acquisition, and communications. These activities will encompass the acquisition of new systems, modifications and updating of existing systems and the operation, maintenance, and repair of these instrumentation systems. Included are highly precise instrumentation radars, analog and digital telemetry systems, precise range timing systems, range intercommunication systems, radio communication systems, tracking laser systems, digital data transmission systems, command and control systems, and digital data processing systems. These instrumentation systems are used in support of both aeronautical and rocket launched flight projects. These flight projects are conducted at WFC or at off-range locations in various parts of the world, depending upon the scientific experiment requirements. The sounding rocket programs supported at Wallops will cover all of the atmospheric and space disciplines in which research is undertaken, utilizing a family of launch vehicles varying in size and power from the small meteorological rockets to the 72-foot Scout with orbital capability. In 1981, more than 400 sounding rockets are to be launched from Wallops Island and remote sites around the world, carrying experiments in the fields of Aeronomy, Energetic Particles, Ionospheric Physics, Meteorology, and Solar Physics.

Of particular interest is the current effort to measure the effect of aerosols on the protective layer of ozone in the upper atmosphere which filters out harmful solar radiation.

CENTER MANAGEMENT AND OPERATIONS SUPPORT 125

Center Management and Operations Support is defined as the support or services being provided to all Wallops Flight Center organizations which cannot be directly identified to a benefitting R&D program or project. The civil service personnel involved are:

Director and Staff

The Center Director, Deputy Director and the immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs and Safety.

Management Support

This category includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Center-wide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation and supplies
- Medical care of employees
- Photographic and graphic support

RESOURCE REQUIREMENTS BY FUNCTION

	<u>1979</u> <u>Actual</u>	<u>1980</u> Budget <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>1981</u> Budget <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>10,476</u>	<u>10,749</u>	<u>11,361</u>	<u>11,440</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	9,006	9,299	9,878	9,936
b. Other than full time permanent positions....	224	251	241	241
c. Overtime and other compensation.....	<u>279</u>	<u>177</u>	<u>210</u>	<u>210</u>
Subtotal, Compensation.....	9,509	9,727	10,329	10,387
2. <u>Benefits</u>	<u>919</u>	<u>977</u>	<u>977</u>	<u>998</u>
Subtotal, Compensation and Benefits.....	<u>10,428</u>	<u>10,704</u>	<u>11,306</u>	<u>11,385</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel... ..	6	10	10	10
2. Personnel training.....	<u>42</u>	<u>35</u>	<u>45</u>	<u>45</u>
Subtotal, Supporting Costs.....	<u>48</u>	<u>45</u>	<u>55</u>	<u>55</u>
Total, Personnel and Related Costs.....	<u>10,476</u>	<u>10,749</u>	<u>11,361</u>	<u>11,440</u>

Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
A. <u>Compensation and Benefits</u>	<u>10,428</u>	<u>10,704</u>	<u>11,306</u>	<u>11,385</u>
1. Compensation.....	<u>9,509</u>	<u>9,727</u>	<u>10,329</u>	<u>10,387</u>
a. Permanent positions.....	9,006	9,299	9,878	9,936

The funds will support 395 permanent positions in 1981. The cost increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the October 1979 pay increase.

Basis of Cost for Permanent Positions

In 1981, the cost of permanent positions will be \$9,936,000 an increase of \$58,000 from 1980. The increase results from the following:

Cost of permanent positions in 1980.....	9,878
Cost increases in 1981.....	+284
Within grade and career advances:	
Full year effect of 1980 actions.....	+120
Partial year effect of 1981 actions.....	+117
Full year effect of 1980 pay increases.....	+47
Cost decreases in 1981.....	-226
Turnover savings and abolished positions:	
Full year effect of 1980 actions.....	-91
Partial year effect of 1981 actions.....	-96
One less paid day in 1981.....	-39
Cost of permanent positions in 1981.....	<u>9,936</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full time permanent positions				
1. cost.....	224	251	241	241
2. Workyears.....	31	29	31	31

The 1981 plan includes 31 workyears which is the same as the 1980 current estimate and will support the following programs:

Distribution of Other than Full Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	18
Summer employment.....	2
Opportunity programs.....	8
Other temporary employment.....	<u>3</u>
Total.....	<u>31</u>

The decrease from the 1980 budget estimate to the 1980 current estimate is due to a reevaluation based on 1979 actual experience.

c. Overtime and Other Compensation.....	279	177	210	210
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Overtime funds are required at WFC primarily to meet operational requirements of the sounding rocket program of the Physics and Astronomy and Space Applications programs. Many factors beyond the Center's control, such as launch schedules, weather holds, and range clearance problems necessitate work beyond normal hours to operate the launch facilities, provide instrumentation support, and conduct tracking and data acquisition activities required to assure mission success. The increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the October 1979 pay increase.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Benefits</u>	919	<u>977</u>	<u>977</u>	<u>998</u>

Following are the amounts of contribution by category:

Civil Service Retirement Fund.....	646	669	691	693
Employee life insurance.....	30	44	32	32
Employee health insurance....	227	247	239	239
Workmen's compensation...	10	13	11	30
FICA...	5	3	3	3
Other benefits..	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Total.....	<u>919</u>	<u>977</u>	<u>977</u>	<u>998</u>

Workmen's compensation estimates reflect the Department of Labor billings for 1980 and 1981.

B. <u>Supporting Costs</u>	<u>48</u>	<u>45</u>	<u>55</u>	<u>55</u>
1. Transfer of Personnel.....	6	10	10	10

The transfer of personnel costs in 1980 and 1981 will cover the expenses for one permanent change of station move planned each year.

2. Personnel Training.....	42	35	45	45
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The estimates for personnel training provide for costs of the WFC engineering technician apprentice program. Current estimates for 1980 and 1981 are increased slightly over the 1980 budget estimate to reflect current experience and to provide **for** Civil Service Reform Act implementation training.

	1979	1980		1981
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
11. <u>TRAVEL</u>	<u>276</u>	<u>406</u>	<u>325</u>	<u>347</u>

Summary of Fund Requirements

A. Program Travel	220	210	232	248
B. Scientific and Technical Development Travel	25	51	53	57
C. Management and Operations Travel	31	<u>145</u>	<u>40</u>	<u>42</u>
Total, Travel.	<u>276</u>	<u>406</u>	<u>325</u>	

Explanation of Fund Requirements

A. <u>Program Travel</u> ..	<u>220</u>	<u>210</u>	232	<u>248</u>
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Program travel is directly related to the accomplishment of the Center's mission and reflects the continuing effort in the procurement and launch activities, the sounding rocket development program, the balloon program, and the aeronautical flight test program. The increase from the 1980 budget to the 1980 current estimate is due to increased travel requirements in support of off-site launch activity.

B. <u>Scientific and Technical Development Travel</u>	<u>25</u>	<u>51</u>	<u>53</u>	<u>57</u>
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Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside WFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government.

C. <u>Management and Operations Travel</u>	<u>31</u>	<u>145</u>	<u>40</u>	<u>42</u>
--	-----------	------------	-----------	-----------

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. The decrease from the 1980 budget estimate to the 1980 current estimate reflects the transfer of the support contract for intra-center transportation services to the Management and Operations function.

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
III. <u>FACILITIES SERVICES</u>	<u>3,317</u>	<u>3,398</u>	<u>3,586</u>	<u>3,771</u>

Wallops Flight Center involves **6,166** acres and a complex of facilities which mainly consist of research, airport, and launch operations facilities. This complex encompasses **1,057,344** gross square feet of building space including three major buildings. Also included are three major technical facilities. This physical plant supports an average daily on-Center population of **900** to **1,100** personnel housed on site. Many of the test facilities are utilized on schedules involving more than one shift and/or frequently during off-peak hours.

Summary of Fund Requirements

A. Maintenance and Related Services

1. Facilities..	999	1,072	985	1,031
2. Equipment.....	<u>110</u>	<u>52</u>	<u>113</u>	<u>121</u>
Subtotal..	1,109	1,124	1,098	1,152
B. <u>Custodial Services</u>	701	718	754	801
C. <u>Utilities Services</u>	<u>1,507</u>	<u>1,556</u>	<u>1,734</u>	<u>1,818</u>
Total, Facilities Services.....	<u>3,317</u>	<u>3,398</u>	<u>3,586</u>	<u>3,771</u>

Explanation of Fund Requirements

A. <u>Maintenance and Related Services</u>	<u>1,109</u>	<u>1,124</u>	<u>1,098</u>	<u>1,152</u>
1. Facilities.....	999	1,072	985	1,031

This activity, requiring **40** workyears of effort, provides for the maintenance, repair and alteration of over **300** buildings and one million square feet of building space on **6,166** acres of land. The corrosive environment at WFC, caused by its proximity to the ocean, requires frequent maintenance and repair of exterior surfaces, roofing, utility distribution systems, mechanical doors, hardware and building equipment.

The decrease from the 1980 budget estimate to the 1980 current estimate is due to decreased requirements for supplies and materials. The increase from 1980 current estimate to the 1981 budget estimate is for negotiated support contract: wage increases. Major types of support in this area are:

	1979	1980		1981
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
a. Ground Maintenance				351
Twenty-one workyears provide for maintenance of lawns, trees and shrubs, and for snow removal.				
b. Maintenance and operations.....				334
Nineteen workyears provide for the maintenance and operation of over 300 buildings.				
c. Supplies.....				346
Provides for the replacement of supplies necessary to the operation of the WFC facility.				
2. Equipment.....	110	<u>52</u>	<u>113</u>	<u>121</u>
Seven workyears provide for the maintenance of facility related equipment at the Center. The increase in the 1980 current estimate and the 1981 budget estimate over the 1980 budget estimate are a result of the transfer of the heating and air conditioning contract into this function from the Facilities function.				
B. <u>Custodial Services</u>	701	718	<u>754</u>	801
Provides for 50 workyears of support service contractor effort for janitorial services, firefighting and ambulance service, and plant security. Also provides for refuse removal, pest control and other miscellaneous services. The increases in the 1980 current estimate and in 1981 estimate over the 1980 budget estimate are for negotiated support contractor wage increases.				
1. Janitorial Services... ..				286
Twenty workyears provide for the cleaning of buildings.				
2. Fire fighting and plant security....				435
Thirty workyears provide for firefighting, ambulance, and security guard service.				

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
3. Miscellaneous..				80
Provides for refuse removal, pest control, laundry and other miscellaneous services.				
C. <u>Utilities.</u>	<u>1,507</u>	<u>1,556</u>	<u>1,734</u>	<u>1,818</u>
The only purchased utilities at Wallops Flight Center are electricity and fuel oil to operate the heating plant. This funding also provides for 15 support contractor workyears to operate and maintain the heating plant and water and sewage facilities. Since the 1980 budget estimate, utility consumption figures have been revised. The increase in 1980 from the budget estimate to the current estimate is due to increased utility rates. The increase in 1981 is due to utility rate and negotiated support service contract wage increases. The purchased utilities are as follows:				
1. Electricity (16,200 MWH).....				778
2. Fuel Oil (1,244 K Gal.)				629

IV. <u>TECHNICAL SERVICES.</u>	<u>575</u>	<u>524</u>	<u>537</u>	<u>963</u>
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Summary of Fund Requirements

A. <u>Automatic Data Processing</u>				
1. Equipment	12	14	14	416
2. Operations	<u>205</u>	<u>118</u>	<u>147</u>	<u>162</u>
Subtotal.....	<u>217</u>	<u>132</u>	<u>161</u>	<u>578</u>
B. <u>Scientific and Technical Information</u>				
1. Library	99	104	112	120
2. Education and Information... ..	<u>15</u>	<u>175</u>	<u>100</u>	<u>100</u>
Subtotal.....	<u>114</u>	<u>279</u>	<u>212</u>	<u>220</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Shop Support and Services</u>	<u>244</u>	<u>113</u>	<u>164</u>	<u>165</u>
Total, Technical Services.....	<u>575</u>	<u>524</u>	<u>537</u>	<u>963</u>

Explanation of Fund Requirements

A. <u>Automatic Data Processing</u>	<u>217</u>	<u>132</u>	<u>161</u>	<u>578</u>
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Provides for administrative data processing including equipment maintenance, programming, and operation. Six workyears of support contractor effort are budgeted for this activity. The increase from the 1980 budget estimate to the 1980 current estimate provides for higher equipment maintenance cost and negotiated support contractor wage increases. The increase in 1981 is to provide for the replacement of the Honeywell 625 Real-Time Data Processing System.

1. Equipment.....	416
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Provides for annual maintenance of remote terminals and peripheral equipment used for administrative data processing, and in 1981, for the replacement of the Honeywell 625 Real-Time Data Processing System.

2. Operations.....	162
--------------------	-----

Six workyears provide programming and operation of equipment used for processing of necessary business data such as payroll and other fiscal records, procurement, and personnel and supply data.

B. <u>Scientific and Technical Information</u>	<u>114</u>	<u>279</u>	<u>212</u>	220
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Includes the purchases of books, supplies and materials for, and the operation of the WFC Technical Library. It also provides for public information services, and for the exhibits, and operation of a Visitor Information Center. The increases in 1980 and 1981 over the 1979 level reflect the completion of the Visitor Information Center (VIC) in 1980 and subsequent operational costs. The decrease of the 1980 current estimate from the 1980 budget estimate reflects completion of the VIC later in 1980 than previously anticipated resulting in reduced operations requirements for the fiscal year.

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u>		1981 <u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
1. Library.....				120
Three workyears are used to operate the Library. The procurement of books, subscriptions, supplies and materials are also covered.				
2. Education and Information... ..				100
One workyear of support contractor effort is used to provide tour guide services for visitors. Provision is also made for the cost of exhibits and the operation of the soon to be completed Visitor Information Center (VIC) at WFC and for miscellaneous other public information services.				
C. <u>Shop Support and Services</u>	<u>244</u>	<u>113</u>	<u>164</u>	<u>165</u>
Four workyears of support contractor effort will be used to provide engineering and fabrication support for facility planning and alteration. The increase from the 1980 budget estimate to the 1980 current estimate reflects a one manyear increase in the engineering services and machine shop support requirements.				
<hr/>				
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>1,162</u>	<u>1,253</u>	<u>1,276</u>	<u>2,456</u>
<u>Summary of Fund Requirements</u>				
A. Administrative Communications....	115	136	136	146
B. Printing and Reproduction.....	70	86	75	80
C. Transportation.. ..	225	80	208	1,208
D. Installation Common Services.. ..	<u>752</u>	<u>951</u>	<u>857</u>	<u>1,022</u>
Total, Management and Operations.....	<u>1,162</u>	<u>1,253</u>	<u>1,276</u>	<u>2,456</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

Explanation of Fund Requirements

A. <u>Administrative Communications</u>	115	<u>136</u>	136	<u>146</u>
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Provides for the operation of the WFC main switchboard and teletype facility, for the cost of leased lines and long distance tolls, and for maintenance services. The increase from 1980 to 1981 is to cover the cost of negotiated support contract wage increases.

1. Long Distance Telephone Service..				6
--	--	--	--	---

Covers the cost of leased lines and long distance tolls.

2. Other Communication Services...				140
--	--	--	--	-----

Five workyears are required to operate the WFC main switchboard and teletype facility. Provision is also made for maintenance and repair services.

B. <u>Printing and Reproduction</u>	<u>70</u>	<u>86</u>	<u>75</u>	<u>80</u>
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Provides for five workyears of support service contractor effort to operate the printing and reproduction facility at WFC. The decrease from the 1980 budget estimate to the 1980 current estimate is due to a slight decrease in requirements for supplies and materials. The increase from the 1980 current estimate to the 1981 budget estimate is to cover the cost of negotiated support contract wage increases.

C. <u>Transportation</u>	225	<u>80</u>	<u>208</u>	<u>1,208</u>
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Includes the cost of commercial off-base services and repairs to the government-owned motor vehicle fleet; the maintenance and repair of the WFC Queen Air aircraft; and freight and related transportation costs. The increase from the 1980 budget estimate to the 1980 current estimate reflects the transfer of the intra-Center transportation contract from the Management and Operations Travel category as well as increased costs for maintenance and repair of motor vehicles and aircraft. The 1981 estimate includes the cost of replacing the 17-year-old Queen Air aircraft with a more modern fuel efficient, turbine powered, and reliable aircraft. This replacement is in keeping with the requirement to upgrade the Queen Air aircraft within NASA, as other agencies have, with newer aircraft that will provide long-term dependability. The replacement aircraft will also increase reliability, safety, maintainability, and performance in satisfying WFC's continuing needs.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Transportation of Things.....				5
Covers the cost of freight charges, and costs related to local moves, i.e., drayage and parcel post,				
2. Maintenance and Repair of Vehicles.....				128
Provides for commercial services and repairs to the Government-owned motor vehicle fleet.				
3. Maintenance and repair of aircraft.. ..				1,075
Provides for approximately one workyear of contractor effort and for parts and supplies required to maintain the WFC Queen Air aircraft. Also provides for the replacement of the 17-year-old Queen Air aircraft in 1981.				
D. <u>Installation Common Services...</u>	<u>752</u>	<u>951</u>	<u>857</u>	<u>1,022</u>
Provides for medical services, rental of copying machines, supplies, materials and equipment used for administrative purposes, supply management, materials handling, and postage. The decrease from the 1980 budget estimate to the 1980 current estimate is due to decreased requirements for supplies and materials, machine rentals and postage. The increase from 1980 to 1981 is for negotiated support contract wage increases.				
1. Medical Services.....				34
Provides for the part-time services of medical doctors in support of the WFC Occupational Health program.				
2. Machine Rental.				155
Covers the rental and maintenance of copying equipment.				
3. Supplies and Equipment.. ..				365
Provides for supplies, materials and equipment necessary for the administrative functions at WFC.				
4. Supply Management... ..				443
Nineteen workyears provide for moving and materials handling and operating the supply system at WFC.				
5. Postage.....				25
Covers the cost of the Center's postal bill.				

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART
Wallops Flight Center

STAFFING CHART		
	<u>CY 80</u>	<u>BY 81</u>
SES	5	5
GS-15	11	11
GS-14	36	40
All Other GS	321	319
Wage Grade	<u>22</u>	<u>20</u>
Total Permanent	395	395

DIRECTOR		
	<u>CY</u>	<u>BY</u>
SES	2	2
GS-15	2	2
GS-14	0	0
All Other GS	3	3
Wage Grade	<u>0</u>	<u>0</u>
Total Permanent	7	7

OPERATIONS DIRECTORATE		
	<u>CY</u>	<u>BY</u>
SES	1	1
GS-15	3	3
GS-14	5	5
All Other GS	112	112
Wage Grade	<u>0</u>	<u>0</u>
Total Permanent	121	121

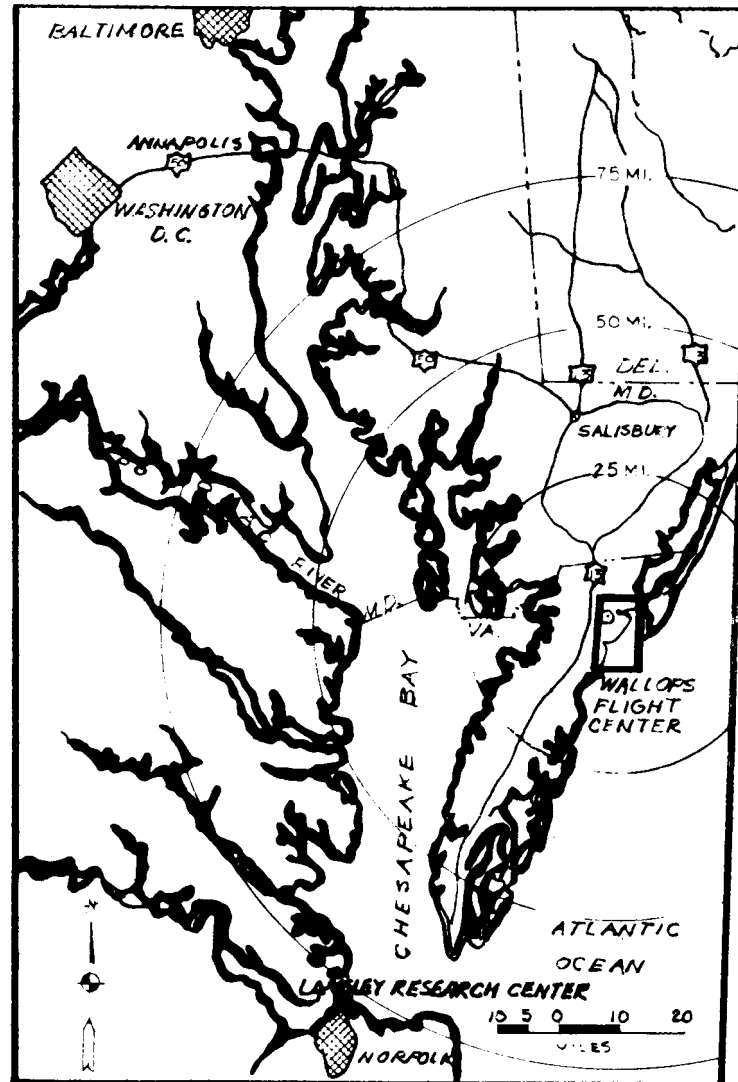
ENGINEERING DIRECTORATE		
	<u>CY</u>	<u>BY</u>
SES	1	1
GS-15	4	4
GS-14	18	20
All Other GS	75	73
Wage Grade	<u>0</u>	<u>0</u>
Total Permanent	98	98

ADMINISTRATION DIRECTORATE		
	<u>CY</u>	<u>BY</u>
SES		
GS-15	1	1
GS-14	4	4
All Other GS	64	64
Wage Grade	<u>0</u>	<u>0</u>
Total Permanent	69	69

TECHNICAL SUPPORT DIRECTORATE		
	<u>CY</u>	<u>BY</u>
SES		
GS-15	0	0
GS-14	1	1
All Other GS	54	56
Wage Grade	<u>22</u>	<u>20</u>
Total Permanent	77	77

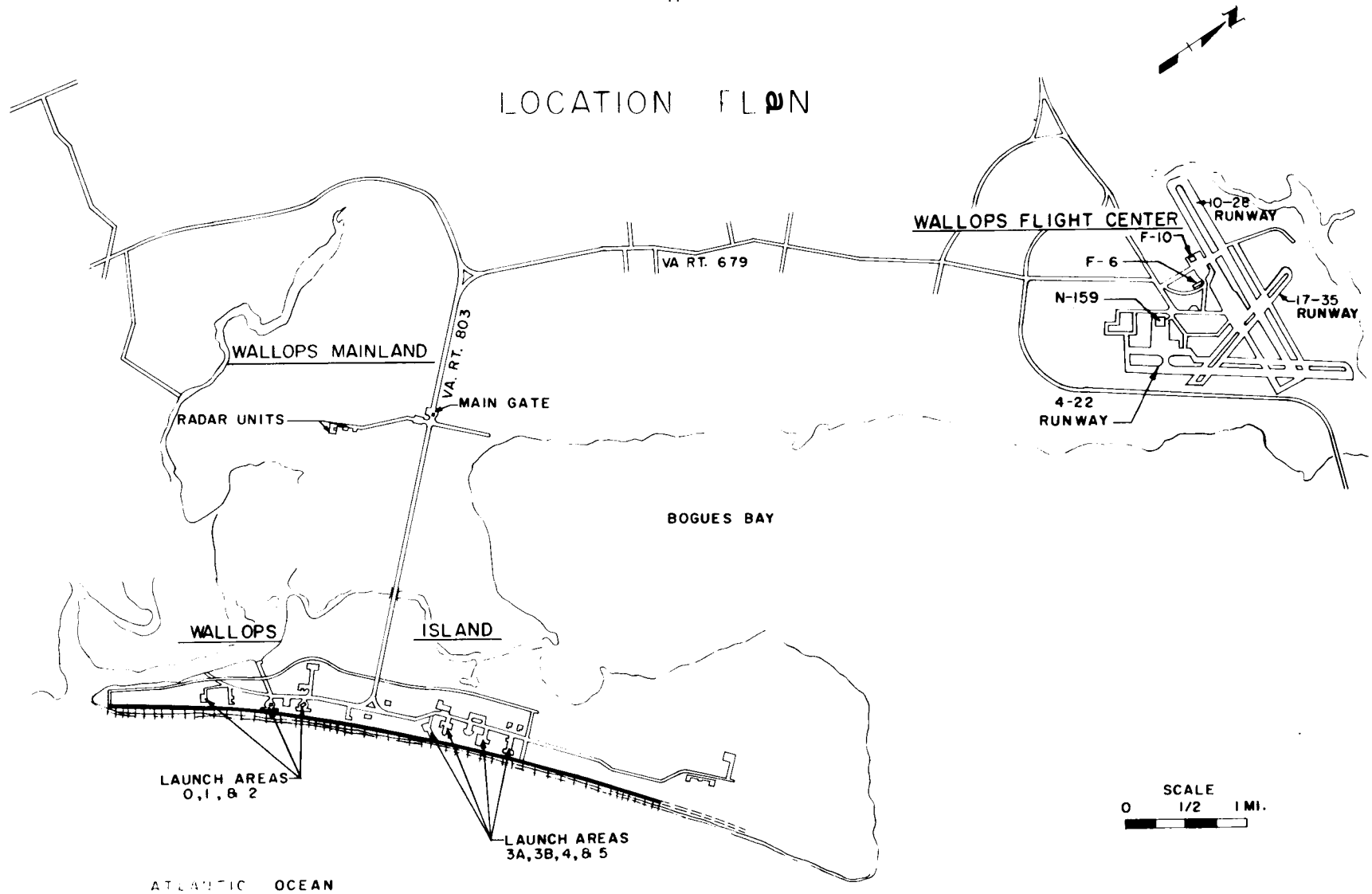
APPLIED SCIENCE DIRECTORATE		
	<u>CY</u>	<u>BY</u>
SES	1	1
GS-15	1	1
GS-14	8	10
All Other GS	13	11
Wage Grade	<u>0</u>	<u>0</u>
Total Permanent	23	23

— WALLOPS — FLIGHT CENTER LOCATION



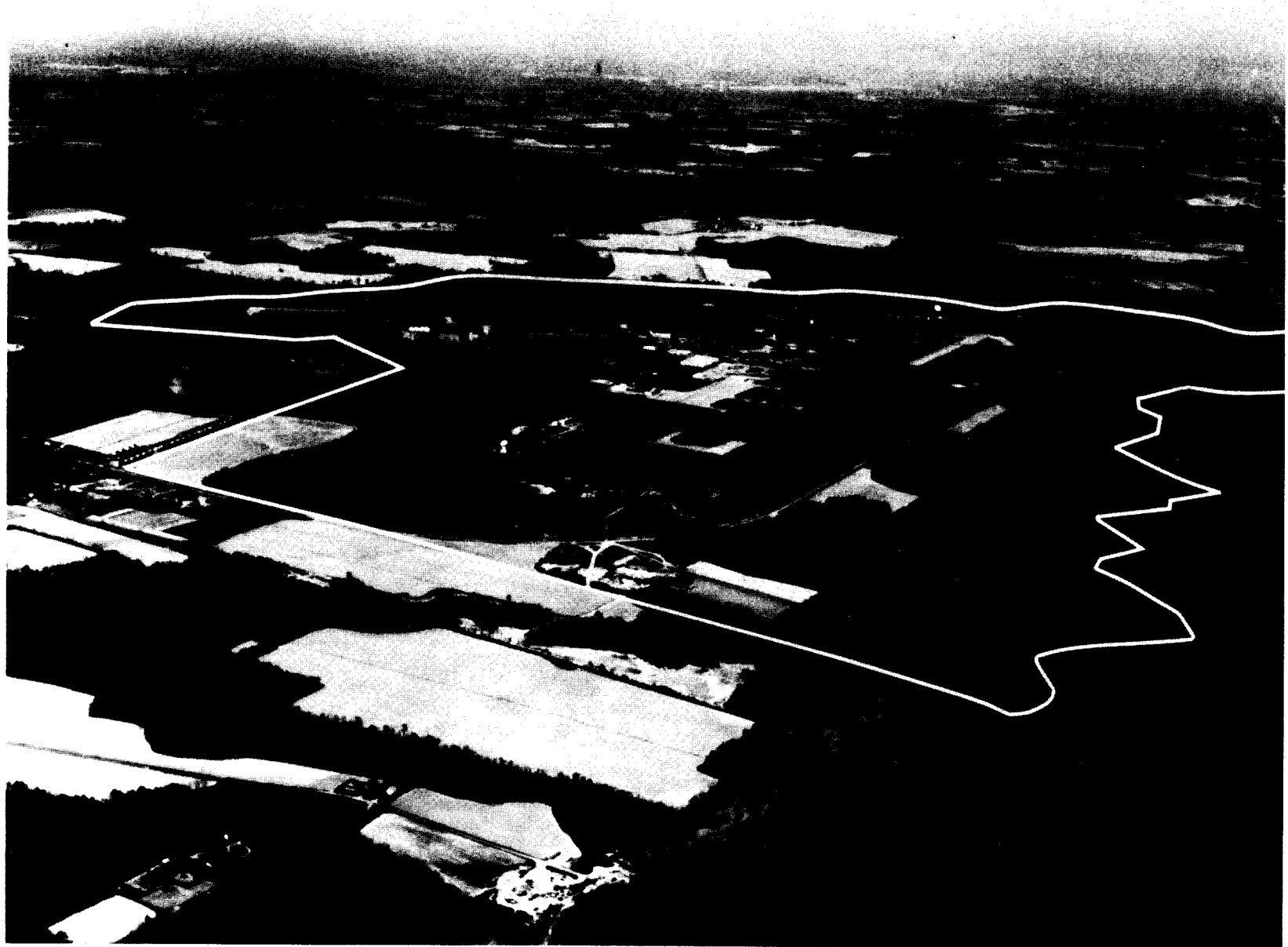
WALLOPS FLIGHT CENTER

LOCATION PLAN





RPM 6-23



RPM 6-24



RPM 6-25

AMES
RESEARCH CENTER



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

AMES RESEARCH CENTER

DESCRIPTION

The Ames Research Center (ARC) is located on 421 acres at the southern end of San Francisco Bay on land contiguous to the U.S. Naval Air Station, Moffett Field, California. Certain facilities, such as the utilities and airfield runways, are used jointly by NASA and the Department of the Navy. Also housed at the ARC is the U.S. Army Research and Technology Laboratory. Personnel from this laboratory work closely with Ames personnel on research of mutual interest. The capital investment at the ARC, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1979, was \$447,809,000.

CENTER ROLES AND MISSIONS

The programs at the Ames Research Center involve research and development in the fields of aeronautics, space science, life science, and space technology, as well as applications to national needs of the new science and technology growing out of the aerospace program. Specifically, the Center's major program responsibilities are concentrated in: short-haul aircraft technology, rotorcraft technology, flight simulation, computational fluid dynamics, planetary probes, airborne sciences and applications, and aeronautical and space life sciences. In addition to these major program responsibilities, the Center provides support for military programs, and various civil aviation projects. The principal and supporting roles are:

PRINCIPAL

Fundamental Aerodynamics - advancing the general state of the art, both theoretical and experimental.

Short-Haul Aircraft Technology - developing a technology base for facilitating incorporation of short-haul aircraft into overall air transportation systems.

Rotorcraft Technology - developing a technology base for improving efficiency and flexibility for both civil and military use.

Computational Fluid Dynamics - furthering the state of the art through the definition of new systems, both hardware and software, and application to aeronautical and other related areas.

Flight Simulation - improving the state of the art to permit more effective use of simulators in aircraft design and validation-of-flight simulation.

Military Support - providing the technical support to military aviation in areas consistent with other ARC aeronautics roles and unique ARC capabilities.

Airborne Research and Applications - operating instrumented jet aircraft for the purpose of conducting airborne research and applications experiments.

Planetary Probes - developing thermal protection systems required for planetary atmosphere entry probes and managing probe development.

Planetary Mission Operations and Data Analysis - completing the currently approved Pioneer series, including associated mission operations.

Life Sciences:

Human-Vehicle Interactions - furthering the state of the art through the study of man-machine and other human factor interactions and considerations involved in aircraft operations.

Biomedical Support Systems - developing advanced technology for development of long duration life support systems and protective systems.

Biological Experiments - developing, managing and operating experiments for determining effects of space flight on (non-human) living organisms and for providing information applicable to solving space medicine problems.

SUPPORTING

Space Transportation Passenger Selection Criteria - developing and evaluating the medical criteria for non-crew passenger selection.

Astronomical Observation Techniques - focusing on airborne research and the developing of infrared techniques and supporting systems for use in Spacelab payloads.

Vertical/Short Take-Off and Landing (V/STOL) Technology - developing a technology base for military V/STOL in support of Department of Defense missions.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979	1980		1981
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
I Personnel and Related Gr	51,456	53,514	56,661	57,113
II Travel.....	1,285	1,313	1,353	1,446
III. Facilities Sis	6,185	7,439	7,804	8,736
IV. Technical Sis	844	909	866	924
V. Management and Operations.....	2,942	2,664	3,117	3,250
Total, fund repts	62,712	65,839	69,801	71,469

Distribution of Permanent Positions by Program

	1979	1980		1981
	Actual	Budget Estimate	Current Estimate	Budget Estimate
<u>Direct Positions</u>				
<u>Space Science</u>	321	324	308	303
Physics and any	94	90	101	98
Planetary exploration.....	89	96	71	69
Life sciences.....	138	138	136	136
<u>Space and Terrestrial Appl</u>	117	112	116	117
Space applications.....	109	107	108	109
Technology utilization.....	8	5	8	8
<u>Aeronautics and Space Envy</u>	807	801	816	820
Aeronautical research and tenly	642	658	651	655
Space research and technology.....	165	143	165	165
Subtotal, direct positions.....	1,245	1,237	1,240	1,240

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
Center Management and Operations Support Positions,	421	416	418	418
Total, permanent: positions.....	<u>1,666</u>	<u>1,653</u>	<u>1,658</u>	<u>1,658</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

PHYSICS AND ASTRONOMY 98

Ames concentrates its physics and astronomy activities in the field of infrared astronomy, taking the agency lead in this discipline.

In 1981, the civil service personnel will provide support for the airborne astronomy program which includes a C-141 aircraft--the Kuiper Airborne Observatory (KAO)--as well as a Lear Jet aircraft. These aircraft are operated by Ames as flying astronomical observatories with the bulk of the observing accomplished by various University research teams. Ames supports these facilities with its in-house science competence and with its in-house capability to operate research aircraft.

Infrared astronomy observation from space platforms avoids obscuration caused by the Earth's atmosphere. Ames has responsibility for instruments to accomplish these observations including development of the telescope portion of the Infrared Astronomical Satellite (IRAS), definition of an advanced instrument for use on Spacelab missions, and studies of instruments that may eventually be used as free flyers in space.

PLANETARY EXPLORATION 69

These civil service personnel are required in 1981 to accomplish the ongoing programs in support of agency goals in planetary exploration. This program consists of a continuing series of project management activities, backed by the scientific expertise of principal investigators from Ames, other NASA Centers and the University community. An in-house supporting research and technology program serves both to maintain the Center's scientific and technological expertise and to provide the stimulus and definition for new planetary missions.

In 1981 the civil service personnel will continue to provide project management and scientific support for: (1) Pioneers 6-9, a series of spacecraft exploring the physics of the interplanetary medium and providing ongoing data on the plasma in which the Earth is immersed; (2) Pioneers 10 and 11, two spacecraft that made close approaches to the planet Jupiter to study both the planet itself and the interaction of the solar wind with the planet's strong magnetic field (these spacecraft were then retargeted by being swung in the Jovian gravity field to explore other regions of the solar system--Pioneer 11 made the first close reconnaissance of Saturn in 1979, and Pioneer 10 has now crossed the orbit of Uranus on its way out of the solar system); (3) Pioneer Venus, launched in 1978, with its orbiter now in place around Venus; and (4) the Galileo project, approved in 1978, a natural outgrowth of the Pioneer Venus atmospheric probes. Ames has responsibility for the Probe portion of this mission.

Ames researchers are playing key roles in all of these missions; Ames scientists are responsible, as principal investigators, for measuring the characteristics of the solar wind in interplanetary space and near Jupiter and Saturn; for measuring the atmospheric structure on Mars, Venus and Jupiter; for measuring atmospheric radiation balance on Venus and Jupiter; for measuring cloud characteristics on Venus and Jupiter; and for studying Mars for possible life-bearing soils and compounds. Ames researchers are also responsible for synthesizing atmospheric models for these planets that can be used to explain their current state and evolution and that can be applied in comparative studies to understand features of the Earth's weather and climate.

Ames principal investigators and their coworkers maintain an active program of laboratory and theoretical studies to develop basic atmospheric modeling concepts, to obtain the necessary physical data on a molecular scale to interpret the spacecraft observations, and to develop new and improved scientific measurements and instrument concepts for use on spacecraft. This program concentrates on planetary atmospheres, and has been particularly active in combining radiative transfer concepts with aerosol physics to obtain comprehensive planetary cloud and dust models.

Permanent Positions
(Civil Service)

LIFE SCIENCES.....

136

In 1981, the civil service personnel will continue to be involved in research, hardware development, and program management related to meeting program milestones in the areas of understanding the effects of space flight on humans and other life forms; managing nonhuman biological experiments in space; developing advanced life support concepts and systems; and understanding the origin, evolution, and distribution of life and life-related chemicals on Earth and elsewhere in the universe. Examples of specific 1981 activities follows:

Space flight simulation studies will continue, with testing of 55- to 65-year old females, and other individuals with borderline of mild hypertension in the program, to understand and develop countermeasures for the physiological stresses of Shuttle flight. Ames investigators will be involved in the development phase of both animal and human experiments for the first dedicated life sciences Spacelab. Research will be underway to determine whether learned autonomic control (biofeedback training) to suppress the symptoms of motion or space sickness is still effective during the performance of a complex cognitive or motor task.

Launch of the first life sciences experiment to fly on the Shuttle will occur on a Shuttle orbital flight test mission. The first flight unit of the Research Animal Holding Facility, configured to hold mice and rats, will be delivered in late FY 1981 for checkout and test at Ames prior to its flight on Spacelab 111. Hardware for U.S. experiments will be delivered to the Soviet Union for the Joint US/USSR Cosmos biological satellite flight in calendar year 1981.

Studies will be under way using closed chambers for investigations of controlled ecology life support systems for space flight.

Research in the origin and distribution of life and life-related molecules will be highlighted by analyses of biochemical pathways in living systems and of chemical abundances in Precambrian deposits by the use of an ultrasensitive stable isotope measuring system, and studies of the interactions of known polypeptides and deoxyribonucleic acid (DNA) segments.

Permanent Positions
(Civil Service)

SPACE APPLICATIONS 109

A highly diversified group of scientifically capable people is required to support programs in Earth Observations including space, atmospheric, and stratospheric programs; to provide skilled personnel and specialized airborne platforms in support of the Agency's applications satellite programs; to provide skilled personnel to interpret and process both spaceborne and airborne remotely sensed data; to provide knowledgeable personnel to interact with and disseminate data and associated processing techniques to the user community.

The Ames stratosphere research program is an integrated activity that blends the expertise of the Center and University scientists both in the development of computer models for the upper atmosphere and in the measurement of stratospheric constituents and properties from aircraft platforms. Computer modeling of the stratosphere is being performed at Ames to understand the unperturbed stratosphere and to predict the effects on the stratosphere of various pollutants, such as aircraft emissions and fluorocarbons, and of natural events such as the solar cycle and solar storms. A similar program is under way for climate focussing on the climatic effects of aerosols in the Earth's atmosphere through models of aerosols and their radiative effects and measurements of aerosol properties from Ames aircraft.

Further, the Center's Space Applications role is fulfilled by: (1) conducting an active and continuing broad program of applied research and development to enhance the use of remote and in situ sensing technology for Earth resources applications and to transfer the ability to use this technology to a variety of Federal, State, regional, and local agencies; (2) working with these agencies to plan, initiate, and develop feasible and economical Earth resources sensing projects tailored to their specific needs; and (3) defining, developing, and evaluating potential satellite sensors, data acquisition and processing techniques, and associated communications technology. The Center controls a variety of operational aircraft, some of which serve as national and international facilities for research in astronomy, geophysics, meteorology, and Earth resources; others acquire data for remote sensing projects and provide a mechanism for integration of spaceborne, airborne, and ground-based data acquisition and processing systems.

In addition, this diversified scientific group: (1) provides management support to the Office of Space and Terrestrial Applications for the airborne instrumentation research program at Ames and other NASA Centers; and (2) provides a mechanism for implementation of applications transfer activities through the Western Regional Remote Sensing Applications Center.

Permanent Positions
(Civil Service)

TECHNOLOGY UTILIZATION..... 8

The Technology Utilization program at Ames is a community undertaking involving the part-time efforts of scientists and engineers in many disciplines and in many Center organizations working under the leadership and coordination of a small full-time Technology Utilization Office staff to move knowledge developed from the NASA programs to industry for effective use in the market place.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 655

In 1981, the content of the Ames program in aeronautics is characterized in terms of three elements: Generic Research and Technology, Vehicle Specific Technology (Short-Haul, Rotorcraft) and aeronautical support to other agencies and to industry. These three elements form a coherent and interdependent program to meet the Vertical/Short Take-Off and Landing (V/STOL) and rotorcraft milestones of improved aerodynamic and operational performance, improved terminal area safety and efficiency, and reduced noise and vibrations.

Generic Research and Technology:

The Generic Research and Technology program at Ames has its principal focus in the areas of computational aerodynamics, experimental methods, avionics, and safety. The program is concentrated in the disciplines of aerodynamics and aeroelasticity, flight dynamics, guidance and control, and human factors. The program

provides the fundamental disciplinary advances, both theoretical and experimental, that extends the state of the art. Substantial progress is anticipated in our ability to compute the theoretical behavior of aerodynamic and propulsive flows and to measure experimental aircraft configuration parameters. In 1981, research programs in flight dynamics will define the important interrelationships between vehicle dynamics, stability and control, and handling qualities in the regime of hover, and in transition from vertical to horizontal flight for advanced V/STOL aircraft and rotorcraft. In guidance and control, the use of optimal control theory in conjunction with dynamic modeling of aircraft and ground-based guidance aids will provide new insight into the definition of air traffic control algorithms, particularly for the terminal area.

In 1981, highlights in the human factors program will include: completion of the development of a baseline generic display of air traffic information for use in an aircraft cockpit; development of helicopter display and control integration to reduce pilot workload; study of advanced flight display formats for improving information presentation to aircrews; and completion of the operation of the NASA/FAA Aviation Safety Reporting System as specified by the implementing Memorandum of Agreement.

Vehicle Specific Technology Short-Haul:

The Vehicle Specific Technology at Ames is focused on short-haul aircraft, both civil and military; Rotorcraft, V/STOL and Short-Range Conventional Take-Off and Landing (CTOL) aircraft. These aircraft have unique characteristics including: a dependence on propulsive life (in addition to aerodynamic lift); greater capability for versatile operations in the terminal area; and a greater degree of integration of man and machine. The vehicle technology emphasis at Ames relates to and depends on the basic capabilities and the aeronautical research disciplines described previously. In 1981, the research program will include small-scale and large-scale wind tunnel testing and ground based simulation, and will culminate in flight research utilizing both rotorcraft and powered-lift research aircraft. This class of aircraft is dependent on high lift technology and low cost guidance and control systems, both of which are part of the ongoing program at ARC. The program includes wind tunnel and simulation investigations to achieve a significantly improved short-haul transport aircraft concept and compatible low cost avionics.

Other Agency and Industry Support:

The Ames Research Center has traditionally received requests from other agencies and from the industry for test support of their aircraft and systems development programs. The Navy and NASA have agreed to a comprehensive technical support program for the Navy V/STOL aircraft technology development. The Army Research and Technology Laboratories of the U.S. Army Aviation Research and Development Command (AURADCOM) is located at Ames. The Aeromechanics Laboratory, the primary investigator of Army rotorcraft flight dynamics and controls, is also located at Ames, working both on independent R&D projects and with a staff integrated into the NASA organization on projects of joint interest. Extensive use is made of Ames aeronautical research facilities in these efforts. There are also a large number of joint programs with the Air Force Systems Command and the Navy Systems Command. Examples of these joint programs are: The Air

Force; Advanced Fighter Technology Integration, Advanced Flight Control Systems, Laser Velocimeter Vortex Flow Measurements, Aero-Optics Program and the A-10 Testing; The Navy; Aerodynamic Test Support of the AV-8B Harrier, V/STOL Fighter Studies and Wing Design Optimization Studies.

Permanent Positions
(Civil Service)

SPACE RESEARCH AND TECHNOLOGY.

165

In 1981, the number of civil service personnel requested will provide a Space Research and Technology Program which encompasses both basic research and project support. The basic research focuses on entry technology and materials research. The project work supports Space Shuttle, Galileo, Infrared Astronomical Satellite (IRAS) and the Orbiter Experiment program (OEX).

In 1981, the entry technology research will provide the aerothermodynamic data required for the design, development, and verification of planetary entry vehicles, and for computational fluid dynamic codes to predict space vehicle flow fields and performance. Work is proceeding to apply laser physics and laser techniques to the development of flow diagnostic tools to remotely probe gas dynamic flows in order to define and verify turbulence models. Research efforts in the materials area will provide thermal protection systems concepts and materials for heat shields to protect earth and planetary entry vehicles (probes), develop computational chemistry codes to calculate basic properties of matter and expand the understanding of surface-environment interactions (corrosion). Research is also being conducted in the advanced electronics and materials area to determine atomic structure and properties of absorbed surface layers and to advance the state of the art of computing wave functions for molecules and atomic clusters.

In 1981, the Shuttle project will be supported with ground-based facilities to study a variety of aerodynamic and thermodynamic problems. The Galileo project will be supported with heat shield design and performance data, heat shield shape change effects on aerodynamics, and subsonic probe stability. In the area of orbiting astronomical instruments, work will continue to develop infrared detectors, to define systems for precision pointing and control of telescopes and to advance the technology required to cool the detectors to below 10 degrees Kelvin for support of the IRAS project. Ames Research Center is supporting two Space Shuttle Orbiter experiments. The first is an OEX experiment for Infrared Imaging of Shuttle (IRIS) to obtain measurements of surface temperatures of the lower and side surfaces of the orbiter by remote imagery from the C-141 Kuiper Airborne Observatory (KAO). The second is to conduct OEX thermal protection experiments to study advanced materials and to evaluate possible cost and weight reductions for the thermal protection system for Shuttle and Advanced Space Transportation Systems,

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 418

Center Management and Operations Support is defined as that support or services being provided to all Ames Research Center organizations which cannot be directly identified to a benefiting program or project. The civil service personnel involved are:

Director and Staff

The Center director, deputy director and the immediate staff, e.g., legal, patent counsel, equal opportunity, planning and analysis, public affairs, energy management and safety.

Management Support

Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, and management information and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment, and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
Administrative data processing and computer support
Centerwide security and protection
Fire protection
Custodial services
Logistics support including transportation, supplies, etc.
Medical care of employees

RESOURCE REQUIREMENTS BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
I ■ <u>PERSONNEL AND RELATED COSTS</u>	<u>51,456</u>	<u>53,514</u>	<u>56,661</u>	<u>57,113</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	45.320	47.175	49.588	49.883
b. Other than full time permanent positions	725	800	1.146	1.240
c. Reimbursable detailees	28	168	168	168
d. Overtime and other compensation	<u>563</u>	<u>461</u>	<u>515</u>	<u>515</u>
Subtotal. Compensation	46.636	48.604	51.417	51.806
2. <u>Benefits</u>	<u>4.419</u>	<u>4.630</u>	<u>4.832</u>	<u>4.895</u>
Subtotal. Compensation and Benefits	<u>51.055</u>	<u>53.234</u>	<u>56.249</u>	<u>56.701</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	120	85	85	85
2. Personnel training	<u>281</u>	<u>195</u>	<u>327</u>	<u>327</u>
Subtotal. Supporting Costs	<u>401</u>	<u>280</u>	<u>412</u>	<u>412</u>
Total. Personnel and Related Costs	<u>51,456</u>	<u>53,514</u>	<u>56,661</u>	<u>57,113</u>

Explanation of Fund Requirements

	1979 <u>Actual</u>	1980		1981
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
A. <u>Compensation and Benefits</u>	<u>51,055</u>	<u>53,234</u>	<u>56,249</u>	<u>56,701</u>
1. <u>Compensation</u>	<u>46,636</u>	<u>48,604</u>	<u>51,417</u>	<u>51,806</u>
a. Permanent positions	45,320	47,175	49,588	49,883

The funds will support 1,658 permanent positions in 1980 and 1981. The increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the October 1979 pay increase.

Basis of Cost for Permanent Positions

In 1981, the cost of permanent positions will be \$49,883,000. The increase from 1980 results from the following:

Cost of permanent positions in 1980.....	49,588
Cost increases in 1981.....	+1,062
Within grade and career advances:	
Full year effect of 1980 actions.....	+440
Partial year effect of 1981 actions.....	+510
Full year effect of 1980 pay increases.....	+112
Cost decreases in 1981.....	-767
Turnover savings and abolished positions:	
Full year effect of 1980 actions.....	-328
Partial year effect of 1981 actions.....	-274
One less paid day in 1981.....	-165
Cost of permanent positions in 1981,	<u>49,883</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full time permanent positions				
1. cost	725	800	1,146	1,240
2. Workyears	81	93	112	116

The 1981 plan includes 116 workyears which will support the following programs:

Distribution of Other than Full Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	32
Summer employment.....	18
Opportunity programs.....	34
Other temporary employment.....	32
Total.....	<u>116</u>

The increase from the 1980 budget estimate to the 1980 current estimate is due to a buildup in two feeder programs: (1) the non-baccalaureate cooperative training program and (2) the NASA Graduate Intern program, the continuation of the part-time permanent program, and the institution of the White House Research Apprenticeships program.

The 1981 estimate reflects a continuation of the 1980 level allowing for the required promotion of the Graduate Interns at the end of their first year and a scheduled buildup in the Research Apprenticeships program.

c. Reimbursable details	28	168	168	168
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The military personnel detailed to the Ames Research Center on a reimbursable basis are individuals experienced in aeronautics, rotorcraft technology and related fields.

The increase in 1980 is due to full-year payment of 5 detailees phased in during late 1979 and early 1980 to support the rotorcraft program. The 1981 estimate provides for continuation of the same level of effort.

	1979	1980		1981
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
d. Overtime and other compensation.....	563	461	515	515

Overtime and night differential are used primarily for off-shift operation of **major** facilities such as the Unitary Plan Wind Tunnel System, the 40- by 80-Foot Subsonic Wind Tunnel, and the 6- by 6-Foot Supersonic Wind Tunnel. The increase from the 1980 budget estimate is due to additional support of 40- by 80-Foot Subsonic Wind Tunnel modification project, the cost of the October 1979 pay increase. Overtime will remain level in 1981.

2. <u>Benefits..</u>	<u>4,419</u>	<u>4,630</u>	<u>4,832</u>	<u>4,895</u>
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Following are the amounts of contribution by category:

Civil Service Retirement Fund.....	3,188	3,291	3,539	3,560
Employee life insurance.....	133	190	150	159
Employee health insurance.....	865	915	877	880
Workman's compensation.....	216	216	246	276
FICA.....	<u>17</u>	<u>18</u>	<u>20</u>	<u>20</u>
Total.....	<u>4,419</u>	<u>4,630</u>	<u>4,832</u>	<u>4,895</u>

The increase from the 1980 budget estimate to the 1980 current estimate is due to pay increases. Workmen's compensation estimates reflect the Department of Labor billings for 1980 and 1981.

The increase in 1981 **over** 1980 is related to the increase in personnel compensation.

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> (Thousands of Dollars)	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
B. <u>Supporting Costs</u>	<u>401</u>	<u>280</u>	<u>412</u>	<u>412</u>
1. Transfer of personnel.....	120	85	85	85
The decrease from the 1979 actual to the current estimates for 1980 and 1981 are due to completion of the personnel transfers related to the rotorcraft project.				
2. Personnel training.....	281	195	327	327
The increase from the 1980 budget estimate to the 1980 current estimate is due to the tuition costs associated with the buildup of the NASA Graduate Intern program (initiated late in 1979) and costs associated with Civil Service Reform Act implementation training.				

II. TRAVEL..... 1,285 1,313 1,353 1,446

Summary of Fund Requirements

A. Program Travel.....	807	927	967	1,031
B. Scientific and Technical Development Travel.....	187	145	145	155
C. Management and Operations Travel.....	<u>291</u>	<u>241</u>	<u>241</u>	<u>260</u>
Total, Travel.....	<u>1,285</u>	<u>1,313</u>	<u>1,353</u>	<u>1,446</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>807</u>	<u>927</u>	<u>967</u>	<u>1,031</u>
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Program travel is required for the accomplishment of the Center's mission and is the largest part of the Ames travel budget, accounting for 71 percent of travel costs for 1981. Travel for program purposes is required for the continuing efforts in space research, aircraft technology, flight simulation, fluid mechanics, airborne research and applications, and space life sciences.

The increase in the 1980 current estimate is required for support of the Infrared Astronomy Satellite, Galileo, Western Regional Applications program, increased C-141 flights and monitoring of various contractor's performance in the construction of the 80- by 120-Foot Wind Tunnel Test section. Increase in program travel in 1981 is needed for: the scheduled flight testing of the Tilt Rotor and the Quiet Short-Haul Research Aircraft (QSRA); the management, coordination and integration of 45 experiments in the Life Science Flight Experiments program scheduled for Spacelab 3 and 4 (which involves trips, to several institutions domestically, in Europe, and Australia); the Ames participation in the Russian Cosmos project and Bed Rest experiment which will require trips to Moscow and Budapest.

		1979	1980		1981	
		<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>	
			(Thousands of Dollars)			
B.	<u>Scientific and Technical Development Travel.....</u>	<u>187</u>	<u>145</u>	<u>145</u>	<u>155</u>

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside ARC, as well as to present both accomplishments and problems to their associates. Many of the meetings are made up of working panels convened to solve certain problems for the benefit of the Government. The level of travel in 1981 is expected to increase to provide for the presentation of additional aeronautical, life sciences and space and astronautical papers to the scientific community.

C.	<u>Management and Operations Travel.....</u>		<u>291</u>	<u>241</u>	<u>241</u>	<u>260</u>
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Management and operations travel provides for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management and procurement activities, and travel of the Center's top management to NASA Headquarters, other NASA Centers, contractor plants, and local transportation. The increase in 1981 allows only for the escalation of the General Services Administration (GSA) rental rates for passenger vehicles and the escalation of fuel costs for passenger vehicles.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
III. <u>FACILITIES SERVICES</u>	<u>6,185</u>	<u>7,439</u>	<u>7,804</u>	<u>8,736</u>

Ames Research Center is located on 421 acres of ground in a complex of facilities made up of laboratory and office type buildings as well **as** research wind tunnels.

This complex encompasses 2,101,754 gross square feet of building space including 10 major buildings. Also included are 11 major technical facilities. This physical plant supports an average daily population of 2,500 to 2,900 personnel. Many of the facilities are utilized on schedules involving more than one shift and frequently during off-peak hours.

Summary of Fund Requirements

A. <u>Rental of Real Property</u>	<u>3</u>	<u>---</u>	<u>---</u>	<u>---</u>
B. <u>Maintenance and Related Services</u>				
1. Facilities.....	327	129	134	135
2. Equipment.....	<u>67</u>	<u>63</u>	<u>67</u>	<u>68</u>
Subtotal.....	394.	<u>192</u>	<u>201</u>	<u>203</u>
C. <u>Custodial Services</u>	<u>1,703</u>	<u>1,640</u>	<u>1,702</u>	<u>1,841</u>
D. <u>Utilities Services</u>	<u>4,085</u>	<u>5,607</u>	<u>5,901</u>	<u>6,692</u>
Total, Facilities Services.....	<u>6,185</u>	<u>7,439</u>	<u>7,804</u>	<u>8,736</u>

Explanation of Fund Requirements

A. <u>Rental of Real Property</u>	<u>3</u>	<u>---</u>	<u>---</u>	<u>---</u>
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	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 Budget <u>Estimate</u>
B. <u>Maintenance and Related Services</u>	<u>394</u>	<u>192</u>	<u>201</u>	<u>203</u>
1. <u>Facilities</u>	327	129	134	135
2. <u>Equipment</u>	67	63	67	68

Maintenance and repair includes the maintenance of grounds and emergency repairs of heating, ventilating, lighting equipment of institutional buildings and offices. The maintenance of grounds include general landscape maintenance of approximately 30 acres of improved planted areas and includes pest control of these areas; maintenance of approximately 45 acres of unimproved areas such as substations, aircraft taxiways, drainage ditch, large fields and along roadways within these areas; and vacuum sweeping approximately 42 acres of streets, parking lots, aircraft ramp, taxiway and V/STOL areas. The 1979 amount includes one-time items such as repair of break in the main water system and resurfacing damaged roads. The estimates for 1980 and 1981 reflect a return to the normal level of effort.

C. <u>Custodial Services</u>	<u>1,703</u>	<u>1,640</u>	<u>1,702</u>	<u>1,841</u>
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This activity involves primarily 65 workyears of support contract effort to provide janitorial and security services, fire protection provided by the U.S. Navy, and other miscellaneous custodial services and supplies. The increase from the 1980 budget estimate to the 1980 current estimate is due to labor rate increases on the security contract. The 1981 increase will provide for the full year effect of previously negotiated contractor wage rates at the same level of effort projected in 1980.

1. Janitorial services (36 workyears of effort)	597
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Janitorial and building cleaning services are associated with approximately 1.6 million square feet of various types of space located in 75 buildings. Services are also provided for 50 trailers being utilized to provide temporary office and shop space.

2. Fire protection services	381
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Fire protection services are provided by the U.S. Naval Air Station, Moffett Field, California. The 1981 estimate is based on the most recent actual cost experience.

3. Security services (29 workyears of effort).....	662
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Included are security services for buildings and property including aircraft and computer facilities. Included also is the provision of "round-the-clock" staffing of the emergency duty office which monitors fire security, and safety alarms and coordinates fire, security, and safety areas in emergency situations.

	1979	1980		
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
4. Other services.....		.....		201
<p>Pest control services, on an as needed basis, are funded in this activity. Also included are refuse collection, laundry and custodial supplies.</p>				
D. <u>Utilities Services</u>	<u>4,085</u>	<u>5,607.</u>	<u>5,901</u>	<u>6,692</u>

The major utility service is electricity with lesser requirements for natural gas, fuel, oil, water and sewage services.

1. Electricity (242,000 mW /Hrs.)	5,614
2. Natural gas (214,000 K cu. ft.)	856
3. Fuel oil (200,000 gals.)	102
4. Water and sewage	120

Utilities include electric power, natural gas, water and sewage services. Electricity is provided by the U.S. Bureau of Reclamation (USBR) and Pacific Gas and Electric Company (P.G. &E.); natural gas is provided by P.G. &E., water by the U.S. Naval Air Station, Moffett Field, and sewage service by the City of Mountain View.

Approximately 80 percent of electric power cost is consumed in the operation of high power demand research facilities such as the Unitary Plan Wind Tunnel System, the 40- by 80-Foot Wind Tunnel, the 3.5-Foot Hypersonic Tunnel, the 14-Foot Transonic Wind Tunnel and in the operation of simulators and smaller wind tunnels, and other research facilities. Approximately 55 percent of natural gas is used in research facilities; the other part is used for heating and ventilation of institutional buildings.

The estimated energy usage and funding levels requested for the 1980 current estimate and 1981 estimate are based on the latest requirements for wind tunnel testings scheduled for the two fiscal years. The requirements for energy are based on a total of eight shifts a day operation of the high speed wind tunnels.

The difference between the 1980 budget estimate and the 1980 current estimate is primarily in consumption of electricity. The 1980 budget cost estimate was based on electric energy usage of 215 million kilowatt hours (M KWH). The 1980 current estimate is based on usage of 252 M KWH to support the level of wind tunnel testing and operations (eight shifts) required in 1980.

The 1981 estimated energy usage of 242 M KWH for an eight shift operation reflects the effect of energy conservation initiatives instituted during 1979 and 1980.

The energy cost estimates in 1980 and 1981 allow for already announced utility rate increases (the USBR in the Federal Register supplemented by local announcements, and PG &E. in its Application Nos. 58545 and 58546 with the California Public Utilities Commission).

	1979 <u>Actual</u>	<u>1980</u>		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u> (Thousands of Dollars)	
IV. <u>TECHNICAL SERVICES</u>	<u>844</u>	<u>909</u>	<u>866</u>	<u>924</u>
<u>Summary of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>				
<u>Operations</u>	480	478	516	555
B. <u>Scientific and Technical Information</u>				
Education and Train	253	257	241	259
C. <u>Shop Support and Sis</u>	<u>111</u>	<u>174</u>	<u>109</u>	<u>110</u>
Total, Technical Sis	<u>844</u>	<u>909</u>	<u>866</u>	<u>924</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>	<u>480</u>	<u>478</u>	<u>516</u>	<u>555</u>

This category reflects the central ADP facility operating costs which are incurred by administrative organizations.- These costs are incurred through a system whereby user organizations are charged for actual usage of the ADP central facility's equipment and services.

	1979	1980		1981
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
1. Operations (18 workyears of effort).....	480	478	516	555

This function includes ADP computer operations and programming that are charged to administrative organizations through the Center's charge-back systems. The charges include the organizations' proportionate share of support service contracts. The increase from 1980 budget estimate to 1980 current estimate is due to a net increase of four workyears of contract support services from a total of 14 in 1980 budget estimate, and an increase in the cost of computer printing paper. The increase in 1980 current estimate over 1979 actual, and 1981 estimate over 1980 current estimate, is due primarily to negotiated support contract wage increases.

B. <u>Scientific and Technical Information</u>	<u>253</u>	<u>257</u>	<u>241</u>	<u>259</u>
1. Education and Information (11 workyears of effort) ...	253	257	241	259

Included in this category is a support service contract to perform public information services (e.g., tour guide), media development (e.g., public exhibits, etc.) and educational programs.

The decrease in the 1980 current estimate from 1979 actual and from 1980 budget estimate, reflects the reduction of the Public Affairs Office (PAO) activity related to the Pioneer/Saturn encounter which was accomplished in September 1979. The increase in 1981 is due primarily to negotiated support contract wage increases.

C. <u>Shop Support and Services</u>	<u>111</u>	<u>174</u>	<u>109</u>	<u>110</u>
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This category includes administrative shop, photo and graphics services. Approximately 61 percent of this function cost is to support the public affairs activity. Subsequently, the decrease in 1980 current estimate from 1979 actual and 1980 budget estimate also reflects the reduction of the PAO activity related to the Pioneer/Saturn encounter. The increase in 1981 reflects a modest escalation in unit cost.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>2,942</u>	<u>2,664</u>	<u>3,117</u>	<u>3,250</u>
<u>Summary of Fund Requirements</u>				
A Administrative Communications.....	841	835	907	916
B Printing and	109	102	90	92
C Transportation.....	165	38	177	194
D. Installation Common Sis	<u>1,827</u>	<u>1,689</u>	<u>1,943</u>	<u>2,048</u>
Total, Management and op	<u>2,942</u>	<u>2,664</u>	<u>3,117</u>	<u>3,250</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Administrative Communications</u>	<u>841</u>	<u>835</u>	<u>907</u>	<u>916</u>

Communication services are provided by the General Services Administration (GSA) for the Federal Telecommunications Service (FTS) and the Pacific Telephone and Telegraph Company for local service. Other communications consists of teletype equipment and services provided by Western Union. The increase in the 1980 current estimate is due to increases in rates. The increase in 1981 reflects increases in rates partially offset by a reduction in requirements.

1. Local telephone services..... 461

The major part of this covers 1,470 Centrex lines and 2,258 telephone instruments which serves about 3,400 individuals on-site at ARC, including on-site contractors and tenants from other Government agencies.

2. Long distance telephone service..... 434

This service is primarily (98 percent) FTS services; the balance (2 percent) is commercial long distance, message unit charges and leased line service charges.

3. Other communications services..... 21

Includes Western Union Telegraphic Services and leased equipment.

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u>	1981 <u>Budget</u> <u>Estimate</u>
B. <u>Printing and Reproduction</u>	<u>109</u>	<u>102</u>	<u>90</u>	<u>92</u>

The estimates for administrative printing includes the Printing and Reproduction Facility operating costs incurred by administrative organizations and includes supplies, materials, equipment acquisition and outside procurements. The reduction in the 1980 current estimate from the 1980 budget estimate is due to a reduction in requirements. The 1981 estimate is essentially level with 1980.

C. <u>Transportation</u>	<u>165</u>	<u>38</u>	<u>177</u>	<u>194</u>
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The estimates include the motor pool operation cost including GSA truck rentals, freight costs, Government bills of lading, air freights and other general shipments. The increase in 1980 from the budget estimate to the 1980 current estimate reflects full funding of the support contract for motor pool operations of four workyears. The increase in 1981 provides for higher GSA rental rates and negotiated support contract wage increases.

D. <u>Installation Common Services</u>	<u>1,827</u>	<u>1,689</u>	<u>1,943</u>	<u>2,048</u>
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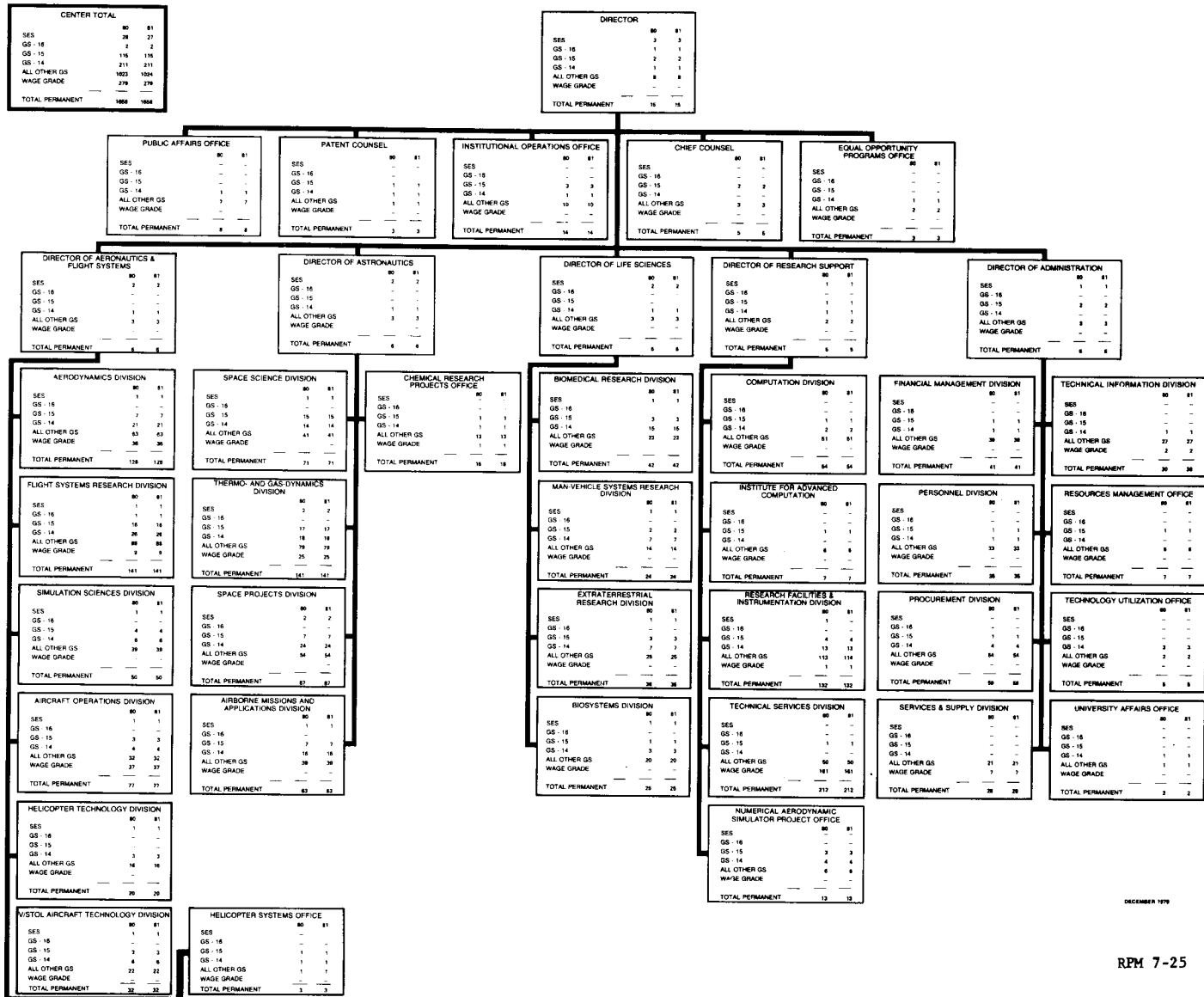
These services include the Center Management and Staff function, medical services operation, and the Installation Support Services activities. The increase from 1980 budget estimate to 1980 current estimate is due to the addition of two support contract service workyears in the installation support services function, and an increase in the workyear wage rate (for the same support service contract) negotiated by the Small Business Administration (SBA) in 1979 which was not accounted for in the 1980 budget estimate. The two additional workyears are based upon greater volume of stores supply warehousing and pickup and delivery activities experienced since the occupancy of the new warehouse facility in 1979. The increase in 1980 current estimate over 1979 actual, and the 1981 estimate over 1980 current estimate allows for a modest escalation of unit costs.

1. Center management and staff.....	346
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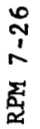
Includes the general management of the Center as an installation and includes such activities as the Directorate offices, general and patent legal services, personnel, procurement, and financial management services. Significant cost items include the various Equal Employment Opportunity (EEO) programs, the Intergovernmental Personnel Act (IPA) programs, various management studies, and management information systems development.

	1979	1980		1981
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
2. Medical services.....			292
Medical services include the staffing of the Health Unit, laboratory service fees, clinic supplies, and maintenance of clinic equipment.				
3. Installation support services (33 workyears of effort)			1,410
Installation support services consist predominantly of the support service contract for supply management, mail, and pickup and delivery services. The balance of the functional costs consist of administrative equipment acquisition, office supplies and materials, maintenance and repair and lease of office equipment, and postage.				

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART
AMES RESEARCH CENTER**



DECEMBER 1979





DRYDEN FLIGHT
RESEARCH CENTER

DRYDEN FLIGHT
RESEARCH CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

HUGH L. DRYDEN FLIGHT RESEARCH CENTER

DESCRIPTION

The Hugh L. Dryden Flight Research Center (DFRC), Edwards, California, is 65 air miles northeast of Los Angeles. The Center is located at the north end of Edwards Air Force Base on 521 acres of land under a permit from the Air Force. The Air Force Base encompasses 300,722 acres. The Center is adjacent to Rogers Dry Lake, a 55-square mile area with a complex of runways varying in length from five to eleven miles.

The physical plant consists of an office-laboratory building with adjoining shops, a flight maintenance hangar, a flight loads research facility, and an integrated support facility. Special Shuttle support facilities include the Orbiter hangar and the Orbiter mating-demating facility. Auxiliary buildings include warehouses, an auxiliary power system building, an aircraft maintenance dock, and hangar. The aerodynamic test range is operated with a site at Edwards, California. The total capital investment of the Dryden Flight Research Center, including fixed assets in progress and contractor held facilities at various locations, as of September 30, 1979, was \$87,910,000.

CENTER ROLES AND MISSIONS

The primary mission of the Dryden Flight Research Center, established in 1947, is to conduct aeronautical flight research in the areas of aerodynamics, structures, control systems, propulsion systems, disciplinary integration effects, safety, operations, and human-vehicle interactions in support of both military and civil national needs. This includes planning, conducting, analyzing, and reporting of flight research for the purposes of verification of predicted characteristics and the identification of unanticipated problems in actual flight. The principal and supporting roles of the Center are:

PRINCIPAL,

Aeronautical Flight Research - conducting flight research using aircraft as test facilities; conducting flight research programs of advanced aerospace vehicle concepts; and innovating concept revisions and supporting systems that ultimately lead to fully operational mission applications.

Flight Test Techniques - determining the suitability of the Remotely Piloted Research Vehicle (RPRV) test technique for flight research.

Flight Instrumentation Development - directing the cooperative efforts in development of new methods and equipment for flight measurements.

Avionic and Flight Control - conducting flight test evaluation of new and innovative concepts in flight control to validate design methods and verify system performance in the flight environment.

Low Speed Aircraft - establishing a flight data base for Vertical/Short Take-off and Landing (V/STOL) aircraft in flight dynamics and operating systems for utilization in the design and development of future civil and military aircraft.

High Speed Aircraft - conducting flight research on advanced configurations and demonstrating the potential for improved aircraft performance through the integration of aircraft systems.

Materials and Structures - conducting tests to increase the understanding of structural responses to aerodynamic heating, with particular emphasis on high temperature space or hypersonic vehicle structures.

Dryden also provides host Center functions for NASA flight activities which are managed by other Centers but which require testing at the Edwards Air Force Base complex. This function includes all institutional support and coordination as well as supervision of flight operations.

SUPPORTING

Shuttle Orbiter - providing landing and recovery capability during Orbital Flight Test (OFT) missions and contingency recovery capability for subsequent operational flights.

Aerodynamic - supporting the development of the technology data base for Laminar Flow Control concepts which could be utilized in future commercial aircraft.

Transport Aircraft - exploring as a cooperative effort, the development and validation of integrated design methods which utilize active flight controls to enhance aircraft structural efficiency.

Advanced Propulsion - supporting flight research programs to establish a technology data base for advanced turbopropeller systems to improve the energy efficiency of future aircraft.

Rotorcraft - supporting the envelope expansion and hazardous flight research testing of research rotorcraft.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979 <u>Actual</u>	<u>1980</u>		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
I. Personnel and Related CS	14,179	14,270	15,176	15,142
II. Travel.....	339	415	394	400
III. Facilities Services.....	2,449	2,661	3,185	3,150
IV. Technical Services.....	408	458	665	789
V. Management and Operations.....	<u>1,693</u>	<u>1,987</u>	<u>2,282</u>	<u>2,200</u>
Total, fund requirements	<u>19,068</u>	<u>19,791</u>	<u>21,702</u>	<u>21,681</u>

Distribution of Permanent Positions by Program

	1979 <u>Actual</u>	<u>1980</u>		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
<u>Direct Positions</u>				
<u>Space Transportation SS</u>	<u>27</u>	<u>19</u>	<u>40</u>	<u>30</u>
Space shuttle.....	27	19	40	30
<u>Space Science</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>
Life sciences.....	1	1	1	2

		1979	1980		1981
		<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Space and Terrestrial Applications.....</u>		<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Technology utilization.....		1	1	1	1
<u>Aeronautics and Space Technology.....</u>		<u>329</u>	<u>319</u>	<u>297</u>	<u>306</u>
Aeronautical research and technology.....	.....	329	319	293	301
Space research and technology.....	....	---	---	4	5
<u>Space Tracking and Data Systems.....</u>		<u>29</u>	<u>30</u>	<u>29</u>	<u>29</u>
Tracking and data acquisition.....		<u>29</u>	<u>30</u>	<u>29</u>	<u>29</u>
Subtotal, direct positions.....		387	370	368	368
<u>Center Management and Operations Support Positions.....</u>		<u>93</u>	<u>91</u>	<u>93</u>	<u>93</u>
Total, permanent positions.....	.....	<u>480</u>	<u>461</u>	<u>461</u>	<u>461</u>

PROGRAM DESCRIPTION

Permanent Positions (Civil Service)

SPACE SHUTTLE..... 30

In 1981, Dryden Flight Research Center (DFRC) will support the Shuttle Orbital Flight Test (OFT) missions and other Shuttle activities. Current planning is for Edwards Air Force Base to be the primary landing site for the first four missions and the secondary landing site for subsequent missions. After landing, the Shuttle Orbiter will be returned to Kennedy Space Center by shuttle carrier aircraft. Dryden will provide operational and institutional support for the Space Shuttle landing activities at Edwards. In addition, Dryden will provide aircraft to test the Microwave Scanning Beam Landing System (MSBLS), provide Orbiter Convoy operations support, and maintain the Shuttle/Carrier Aircraft facility.

LIFE SCIENCES..... 2

In 1981, it is planned to develop and evaluate cost effective, reliable human-machine control systems for use in remote manipulation such as manual landing of Shuttle type vehicles. Flight studies of remotely piloted high performance vehicles will be performed to determine information requirements and procedures necessary for descent, approach, flare, touchdown, and rollout without direct external vision. Television sensors and displays with inside-out references will be evaluated to define optimum human-machine design characteristics.

TECHNOLOGY UTILIZATION..... 1

In 1981, one civil servant is required to continue studies of various means to improve the aerodynamic efficiency of ground vehicles. Various add-on devices, which potentially could be manufactured by small businesses, will be evaluated.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 301

The aeronautical program includes continuing work in research and technology base areas and conducting specific systems technology flight research programs involving fluid physics, propulsion, structures, avionics and controls, human factors and multidisciplinary research and Conventional Take-Off and Landing (CTOL), rotorcraft, Vertical/Short Take-Off and Landing (V/STOL), and high performance type aircraft. The majority of the programs are joint or cooperative efforts with the military, other NASA Centers or Government agencies where the unique flight research facilities and capabilities at Dryden provide an important part in the development or demonstration of technology areas of interest.

In 1981, the objective of the activities under the research and technology base program is to provide continuing research and development efforts in all technical discipline areas so that improved understanding can be applied to problems associated with aircraft in all flight regimes. Flight research in the Research and Technology (R&T) base program in 1981 includes flight demonstration of an active flutter suppression system on a highly elastic supercritical wing on a Firebee II vehicle; flight testing of a low cost AD-1 vehicle to evaluate fundamental aspects of controlling an oblique wing aircraft; and flight tests of digital fly-by-wire experiments to support development of advanced avionics technology. Effort will also continue toward the development of new or improved flight test techniques and flight test instrumentation to increase NASA's capability to conduct flight research.

The Systems Technology program in 1981 will include joint ARC/DFRC flight tests to complete the envelope expansion for the Tilt Rotor Research Aircraft; participation in the joint NASA/USAF AFTI/F-111 program for research and development of a Mission Adaptive Wing to obtain in-flight smooth contour changes to the wing aerodynamic shape to achieve improved aerodynamic efficiency; using a digital flight control system for conventional and nonconventional control without degrading overall performance; continued joint NASA/Navy F-14/Stores High Alpha flying qualities program to define safe operating envelope and means for avoiding departure/spins; continued flight evaluation of the advanced technologies incorporated in the Highly Maneuverable Aircraft Technology (HiMAT) aircraft; Aircraft Energy Efficiency (ACEE) programs including flight evaluation of an active control system that will provide gust alleviation, maneuver load control and flutter suppression for the Aeroelastic Research Wing Vehicle (ARW-2) as part of a joint Langley/Dryden program; and, acoustic flight tests of advanced high tip-speed propellers, developed by Lewis, in support of the advanced turboprop program.

Permanent Positions
(Civil Service)

SPACE RESEARCH AND TECHNOLOGY..... 5

This work is directed primarily toward developing and conducting selected Space Shuttle experiments and performing disciplinary research in the high temperature space structures technology area.

The Shuttle experiments includes the development of a Shuttle Entry Air Data System (SEADS); acquisition of Shuttle lift and drag data at hypersonic speeds; studies to evaluate adequacy and provide a basis for improving Shuttle handling qualities criteria; and application of modified maximum likelihood parameter estimation methods for determination of digital flight control system, stability and control, performance, and structural and atmospheric turbulence characteristics in the Shuttle reentry environment.

High temperature space structures disciplinary research will involve analysis and laboratory tests of medium size specimens to evaluate predictive techniques for thermal structures. Also airloads data will be obtained from calibrated strain gages on the Orbiter and compared with wind tunnel and theoretical predictions to evaluate flight measurement technique and analytical methods.

TRACKING AND DATA ACQUISITION..... 29

In 1981, DFRC will maintain and operate the NASA Aerodynamic Test Range (ATR), which provides direct operational support for a wide variety of aerodynamic and aerospace programs. During mission support operations, the various functional elements such as radar, tracking and data processing, communications, video telemetry acquisition, and telemetry data processing all function in a coordinated manner to provide real time control and monitoring capabilities.

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 93

Center Management and Operations Support is defined as that support or services being provided to all Dryden Flight Research Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and immediate staff, and staff organizations, e.g., Legal, Patent Counsel, Equal Opportunity, Safety and Public Affairs.

Management Support - Includes a wide range of activity categorized as management support for program and functional organizations for the entire Center. Specific functions include resources and budget management, program control, contracting and procurement, personnel management, institutional support, financial management and management information systems analysis, development, and maintenance.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment, and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Center-wide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphics support

RESOURCE REQUIREMENTS BY FUNCTION

	199	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>14.179</u>	<u>14.270</u>	<u>15.176</u>	<u>15.142</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
• • Permanent positions	12.061	12.200	12.805	12.762
b. Other than full time permanent	375	382	564	595
■ Reimbursable detailees	68	106	78	78
d. Overtime and other compensation	265	211	248	230
Subtotal. Compensation	12.769	12.899	13.695	13.665
2. <u>Benefits</u>	<u>1.234</u>	<u>1.221</u>	<u>1.306</u>	<u>1.298</u>
Subtotal. Compensation and Benefits	<u>14.003</u>	<u>14.120</u>	<u>15.001</u>	<u>14.963</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	70	58	58	63
2. Personnel training	<u>106</u>	<u>92</u>	<u>117</u>	<u>116</u>
Subtotal. Supporting Costs	<u>176</u>	<u>150</u>	<u>175</u>	<u>179</u>
Total. Personnel and Related Costs	<u>14.179</u>	<u>14.270</u>	<u>15.176</u>	<u>15.142</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>	<u>14.003</u>	<u>14.120</u>	<u>15.001</u>	<u>14.963</u>
1. <u>Compensation</u>	<u>12.769</u>	<u>12.899</u>	<u>13.695</u>	<u>13.665</u>
■ ■ Permanent positions	12.061	12.200	12.805	12.762

The 1981 estimate supports a permanent personnel complement of 461 positions. The current estimate for 1980 is increased from the 1980 budget estimate as a result of the October 1979 pay increase.

Basis of Cost for Permanent Positions

In 1981, the cost of permanent positions will be \$12,762,000, a reduction of \$43,000 from the 1980 current estimate. The estimates are derived from the following calculations:

Cost of permanent positions in 1980.....	12,805
Cost of increases in 1981.....	+279
Within grade and career advances:	
Full year effect of 1980 actions.....	+131
Partial year effect of 1981 actions.....	+136
Full year effect of 1980 pay is	+12
Cost decreases in 1981.....	-322
Turnover savings and abolished positions:	
Full year effect of 1980 dis	-124
Partial year effect of 1981 dis	-148
One less paid day in 1981.....	-50
Cost of permanent positions in 1981... ..	<u>12.762</u>

	<u>1980</u>		1981
1979	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
	(Thousands of Dollars)		

b. Other than full time permanent positions

1. Cost.....	375	382	564	595
2. Workyears.....	41	44	60	62

The 1980 current estimate increases from the 1980 budget estimate is due to the continuation of a part-time employment program, the reinstitution of the junior college cooperative training program, and

an increase due to the White House Research Apprenticeship program. This effort will support the following programs as shown:

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	32
Opportunity programs.....	19
Summer employment.....	2
Other temporary employment.....	<u>9</u>
Total.....	<u>62</u>

	1979	1980		1981
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
c. Reimbursable costs	68	106	78	78

The services of a small group of military officers are used in the Center's programs where such assignments are of mutual benefit to NASA and the respective service. Under the existing agreements, the parent organization is reimbursed for salaries and related costs. The reduction from the 1980 budget estimate to the 1980 current estimate is due to a reduction of one military detailee.

d. Overtime and other costs	265	211	248	230
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Overtime is restricted to emergency repairs and abnormal temporary workload. A substantial portion is used to prepare for test flights. The 1980 current estimate increase from the 1980 budget estimate reflects the Shuttle schedule slip into 1980, and the October 1979 pay increase.

2. <u>Benefits</u>	<u>1,234</u>	<u>1,221</u>	<u>1,306</u>	<u>1,298</u>
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Following are the amounts of contribution by category:

Civil Service Retirement and	879	869	942	941
Employee life insurance.....	37	42	43	43
Employee health insurance*	256	270	265	263

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
Workmen's compensation.....	31	33	35	42
FICA.....	5	7	8	9
Severance pay.....	<u>26</u>	<u>---</u>	<u>13</u>	<u>---</u>
Total.....	<u>1,234</u>	<u>1,221</u>	<u>1,306</u>	<u>1,298</u>

The current estimate for 1980 is higher than the 1980 budget estimate due to the October 1979 pay increase. The 1981 estimate reflects the full year cost of the pay increase which is slightly offset by savings due to the full year effect of manpower reductions.

Workmen's compensation costs are based on the anticipated Department of Labor billings for 1980 and 1981.

B Supporting @	<u>176</u>	<u>150</u>	<u>175</u>	<u>179</u>
1. Transfer of personnel.....	70	58	58	63

The costs associated with the transfer of personnel include movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station.

.....2...Personnel	106	92	117	116
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Training funds provide for the maintenance and expansion of skills which are essential in carrying out the agency's many complex technical programs. The cost reflects tuition and related fees at a number of government and nongovernment institutions. The 1980 and 1981 amounts allow for announced increases in tuition costs and Civil Service Reform Act implementation training.

	1979 <u>Actual</u>	1980		1981
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
II. <u>TRAVEL</u>	<u>339</u>	<u>415</u>	<u>394</u>	<u>400</u>
<u>Summary of Fund Requirements</u>				
A Program <u>Travel</u>	204	280	266	270
B Scientific and Technical Development <u>Travel</u>	24	31	28	29
C Management and Operations <u>Travel</u>	<u>111</u>	<u>104</u>	<u>100</u>	<u>101</u>
Total, <u>Travel</u>	<u>339</u>	<u>415</u>	<u>394</u>	<u>400</u>

Explanation of Fund Requirements

A <u>Program Travel</u>	<u>204</u>	<u>280</u>	<u>266</u>	<u>270</u>
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Program travel is directly related to the accomplishment of the Center's mission. Travel for program purposes is required for continued joint programs between DFRC and other Centers and includes the support of flight test techniques, flight measurements, avionics and flight control, and flight measurement development activities. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel in 1980 to implement Section 112 of Public Law 96-86.

B. <u>Scientific and Technical Development Travel</u>	<u>24</u>	<u>31</u>	<u>28</u>	<u>29</u>
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Scientific and technical development travel permits employees to participate in meetings and seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technical advances outside Dryden, as well as to present accomplishments and problems to their associates. Many of the meetings consist of working panels convened to solve specific governmental problems. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel in 1980 to implement Section 112 of Public Law 96-86.

C <u>Management and Operations Travel</u>	<u>111</u>	<u>104</u>	<u>100</u>	<u>101</u>
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; administrative training travel; and local transportation. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel in 1980 to implement Section 112 of Public Law 96-86.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
III. <u>FACILITIES SERVICES</u>	<u>2,449</u>	<u>2,661</u>	<u>3,185</u>	<u>3,150</u>

The Dryden Flight Research Center (DFRC) is located on 521 acres and occupies a complex of facilities consisting of laboratory and office-type buildings as well as flight test facilities.

This complex encompasses 459,447 gross square feet of building space including two major buildings. Also included are seven major technical facilities. This physical plant houses an average daily on-Center population of 1,200 to 1,500 personnel. Many of the test facilities are utilized on schedules involving more than one shift.

Summary of Fund Requirements

A. <u>Rental of Real Property</u>	<u>50</u>	<u>65</u>	<u>75</u>	<u>37</u>
B. <u>Maintenance and Related Services</u>				
1. Facilities.....	1,267	1,048	1,384	1,422
2. Equipment.....	<u>84</u>	<u>80</u>	<u>93</u>	<u>102</u>
Subtotal.....	<u>1,351</u>	<u>1,128</u>	<u>1,477</u>	<u>1,524</u>
C. <u>Custodial Services</u>	<u>740</u>	<u>1,015</u>	<u>1,196</u>	<u>1,089</u>
D. <u>Utility Services</u>	<u>308</u>	<u>453</u>	<u>437</u>	<u>500</u>
Total, Facilities Services.....	<u>2,449</u>	<u>2,661</u>	<u>3,185</u>	<u>3,150</u>

Explanation of Fund Requirements

A. <u>Rental of Real Property</u>	<u>50</u>	<u>65</u>	<u>75</u>	<u>37</u>
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This item provides for the rental of trailers to provide office, shop, laboratory, and storage space in support of the Space Shuttle Orbital Flight Test (OFT) program. The 1980 current estimate is increased

from the 1980 budget estimate due to an increase in OFT support in 1980. The decrease in 1981 is associated with the current OFT flight schedule.

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1981 <u>Budget Estimate</u>
B. <u>Maintenance and Related Services</u>	<u>1,351</u>	<u>1,128</u>	<u>1,477</u>	<u>1,524</u>
1. <u>Facilities</u>	<u>1,267</u>	<u>1,048</u>	<u>1,384</u>	<u>1,422</u>

This activity involves all DFR and facilities provided by the Air Force, including those used for Shuttle, and tracking and communication facilities. The increase in the 1980 current estimate over the 1980 budget estimate and the increase in the 1981 estimate is due to negotiated support contractor increases.

•• Maintenance and repair services (30 workyears of effort).....				1,168
b. Engineering services (four workyears of effort).....				136
c. Supplies and materials.....				21
d. Other services.....				97
2. <u>Equipment</u>	<u>84</u>	<u>80</u>	<u>93</u>	<u>102</u>

This activity involves three workyears of effort for the maintenance of facility-type equipment by a support service contractor. The increase in the 1980 current estimate from the 1980 budget estimate and in 1981 are due to negotiated support contractor rate increases.

C. <u>Custodial Services</u>	<u>740</u>	<u>1,015</u>	<u>1,196</u>	<u>1,089</u>
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This activity involves a total of 45 workyears of effort to provide for security, janitorial, and refuse handling. The increase in funding required in the 1980 current estimate is based on an increased level of effort to support the OFT program. The decrease in 1981 is related to the current OFT flight schedule.

1. Janitorial services (18 workyears of effort).....				511
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	1979	1980		1981
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
This activity includes:				
a	Janitorial services			
b	Refuse			
2. <u>Security guard services (27 workyears of effort).....</u>				578
This activity includes:				
a	Security of all on-site Government facilities and equipment			
b	Mail and messenger service			
c	Badging of all on-site personnel and visitors			
D. <u>Utilities.....</u>	<u>308</u>	<u>453</u>	<u>437</u>	<u>500</u>
Utility services are purchased through Air Force contracts with regional utility companies. Costs are based on Air Force projected rates. The major amount is for electricity with lesser amounts for natural gas, fuel oil, water and sewage services. A summary of the proposed DFRC utilities budget for 1981 is as follows:				
1. Electricity (14,000 mWh).....				373
2. Natural gas (22,000 K cu. ft.).....				80
3. Fuel oil (45,000 gals.).....				29
4. Water and sewage.....				16
5. Other.....				<u>2</u>
Total.....				<u>500</u>

		1979	1980		1981
		<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>Budget</u> <u>Estimate</u>
IV.	<u>TECHNICAL SERVICES</u>	<u>408</u>	<u>458</u>	<u>665</u>	<u>789</u>
<u>Summary of Fund Requirements</u>					
A.	<u>Automatic Data Processing</u>				
1.	Equipment	103	---	28	229
2.	Operations	<u>110</u>	<u>261</u>	<u>221</u>	<u>330</u>
	Subtotal.....	<u>213</u>	<u>261</u>	<u>249</u>	<u>559</u>
B.	<u>Scientific and Technical Information</u>				
1.	Library.....	19	15	15	17
2.	Education and Information.....	<u>55</u>	<u>66</u>	<u>249</u>	<u>65</u>
	Subtotal.....	<u>74</u>	<u>81</u>	<u>264</u>	<u>82</u>
C.	<u>Shop Support and Services</u>	<u>121</u>	<u>116</u>	<u>152</u>	<u>148</u>
	Total, Technical Services.....	<u>408</u>	<u>458</u>	<u>665</u>	<u>789</u>

Explanation of Fund Requirements

A.	<u>Automatic Data Processing</u>	<u>213</u>	<u>261</u>	<u>249</u>	<u>559</u>
1.	Equipment	103	---	28	229

Concerns the support purchase and lease of equipment that is necessary to satisfy the payroll, personnel, accounting and management information systems requirements of NASA and DFRC management. The increase in the 1980 current estimate reflects an equipment purchase to begin development of an accounting information system. The 1981 estimate includes a one time purchase of accounting system hardware to support the accounting information system currently being developed.

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 Budget <u>Estimate</u>
2. Operations (seven workyears of effort)	110	261	221	330
<p>This function includes administrative key punch and programming services required to support the management information system. The decrease in the 1980 current estimate from the 1980 budget estimate reflects a reduction in programming requirements. The increase in 1981 operations reflects additional software redesign and development needed to support the purchase of the new accounting hardware system.</p>				
B. <u>Scientific and Technical Information</u>	<u>74</u>	<u>81</u>	<u>264</u>	<u>82</u>
1. Library	19	15	15	17
<p>Provides for the purchase of books, supplies, and materials for the operation of the Dryden Flight Research Center library.</p>				
2. Education and Information	55	66	249	65
<p>Provides for the gathering and dissemination of information about the Center's program to the mass communications media, the general public, and to the educational community at the elementary and secondary school levels. Assistance to the mass communications media includes the gathering and exposition of news-worthy material in support of media requests, and takes such forms as press kits, news releases, television and radio information tapes and clips, and feature material. The 1980 current estimate exceeds the 1980 budget estimate due to the funding of the Public Affairs Office (PAO) in support of Shuttle flights scheduled in FY 1980. The 1981 estimate is due to the reduced PAO requirements based on the current Shuttle schedule.</p>				
C. <u>Shop Support and Services</u>	<u>121</u>	<u>116</u>	<u>152</u>	<u>148</u>
<p>Provides funding for four workyears of support service contractors for graphics, safety, and audio visual. The 1980 current estimate exceeds the 1980 budget estimate due to a slight increase in supplies, contract support costs and Shuttle support.</p>				

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>1,693</u>	<u>1,987</u>	<u>2,282</u>	<u>2,200</u>

Summary of Fund Requirements

A. Administrative Communications.....	431	379	602	551
B. Printing and Reproduction.....	159	36	92	90
C. Transportation.....	231	309	292	328
D. Installation Common Services.....	<u>872</u>	<u>1,263</u>	<u>1,296</u>	<u>1,231</u>
Total, Management and Operations.....	<u>1,693</u>	<u>1,987</u>	<u>2,282</u>	<u>2,200</u>

Explanation of Fund Requirements

A. <u>Administrative Communications</u>	<u>431</u>	<u>379</u>	<u>602</u>	<u>551</u>
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Includes estimates for Federal Telecommunications Systems (FTS), local telephone and exchange service, rental of TWX equipment, and four telephone operators provided under a support service contract. The 1980 current estimate exceeds the 1980 budget estimate due to increased telephone rates, installation of a new direct dial switchboard and the addition of one telephone operator. The 1981 estimate reflects a reduction in main lines and telephone instruments.

1. Local telephone service.....	369
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This funding covers the service for 535 main lines, 792 telephone instruments at the Center, and five main lines to Lancaster, California. Also included are the lease of switchboard equipment, commercial toll charges, and the support service contract for four telephone operators.

2. Long distance telephone service.....	179
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This category reflects funding to support 26 FTS lines.

3. Other communications services.....	3
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This funding covers the teletype (TWX) service.

	1979	1980		1981
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
B <u>Printing and Binding.....</u>	<u>159</u>	<u>36</u>	92	<u>90</u>

Includes the contractual publication of information and materials, and the related composition and binding operations. All common processes of duplication, including photostating, blue printing and micro-filming are included. The 1979 actual includes the one-time purchase of a Xerox 9400 copier. The 1980 current estimate is increased as Xerox lease and maintenance costs have been transferred from Installation Common Services. This cost amounts to about \$50,000 per year and was transferred so that costs would be correctly aligned with the proper function.

C <u>Transportation.....</u>	<u>231</u>	<u>309</u>	<u>292</u>	<u>328</u>
------------------------------	------------	------------	------------	------------

Provides funds for Government bills of lading issued to common carriers to move freight by rail, truck, water, and air; to fund shipments by United Parcel Services; and contract support of eight workyears for the Center's general purpose vehicles. The decrease from the 1980 budget estimate to the 1980 current estimate is due to a deferral in the purchase of motor vehicles for the truck fleet until 1981. The increase in 1981 is due to the purchase of two more motor vehicles than planned in 1980.

D. <u>Installation Common Services.....</u>	<u>872</u>	<u>1,263</u>	<u>1,296</u>	<u>1,231</u>
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This category provides for: physical examinations for DFRC pilots; funding for the Occupational Health Support contract; Test Center for Shuttle support; supplies, materials, and equipment to support the general administrative effort; rental of equipment; and the supply management support service contract. The increase in the 1980 current estimate from the 1980 budget estimate reflects full year funding of the occupational health contract. This increase will be slightly offset with a decrease in the purchase of supplies and materials. The decrease in 1981 is due to reduced Shuttle support requirements.

1. Pilot physicals and occupational health.....	233
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This category includes the costs for DFRC pilot's physicals performed by the Lovelace Clinic in Albuquerque, New Mexico.

2. Air Force Flight Test Center (AFFTC) support.....	78
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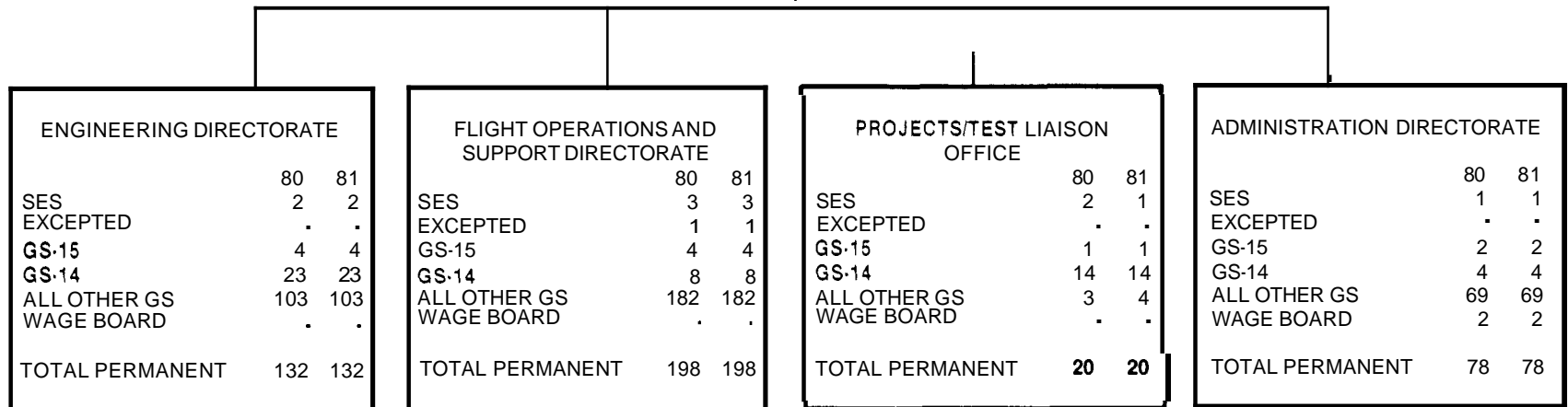
This category includes reimbursement to the Air Force for services and miscellaneous supplies and materials provided in support of the Space Shuttle Orbital Flight Test (OFT) program.

	<u>1979</u>	<u>1980</u>		<u>1981</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. Supplies and equipment				242
This category funds office supplies and equipment, and miscellaneous common service supplies and equipment.				
4. Rental of equipment				16
Rental equipment is mostly office (e.g., photocopy) machines that are more economical to rent than to buy.				
5. Supply management services				583
Provides funding for supply system operation by support service contractor.				
6. Postage.....				41
7. Maintenance of equipment				28
8. Other services				10

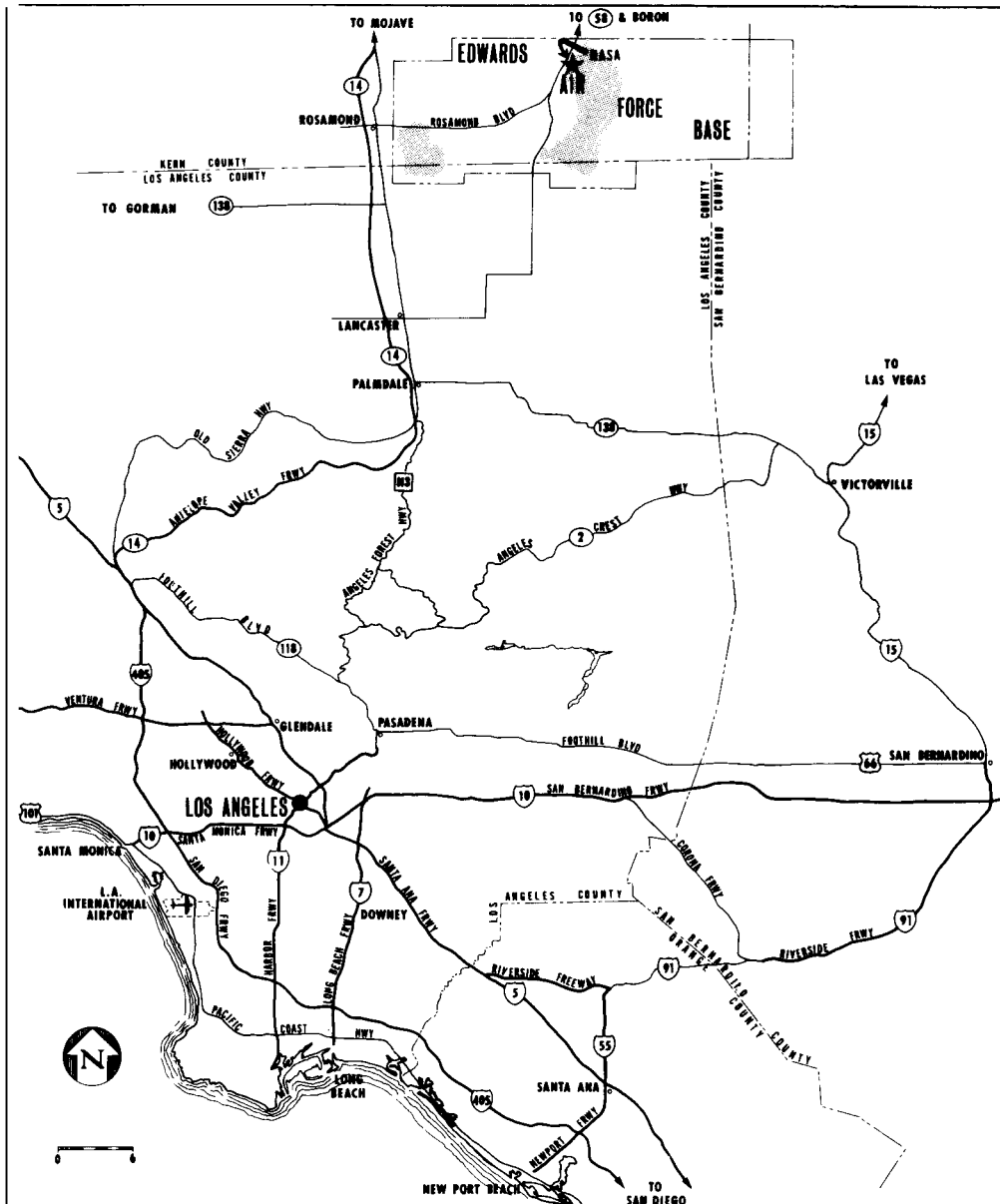
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION HUGH L. DRYDEN FLIGHT RESEARCH CENTER

SUMMARY STAFFING		
	80	81
SES	11	10
EXCEPTED	1	1
GS-15	15	15
GS-14	52	52
ALL OTHER GS	380	381
WAGE BOARD	2	2
TOTAL PERMANENT	461	461

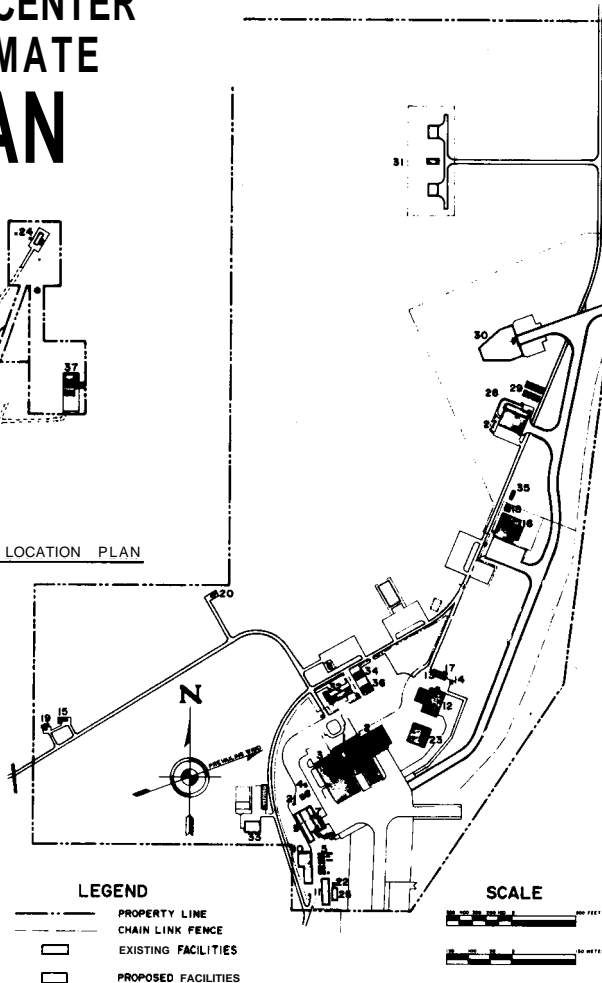
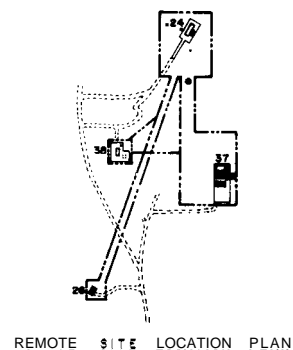
OFFICE OF THE DIRECTOR		
	80	81
SES	3	3
EXCEPTED	.	.
GS-15	4	4
GS-14	3	3
ALL OTHER GS	23	23
WAGE BOARD	.	.
TOTAL PERMANENT	33	33



KEY PLAN



DRYDEN FLIGHT RESEARCH CENTER FISCAL YEAR 1981 ESTIMATE LOCATION PLAN



EXISTING FACILITIES

- 1 LABORATORY BUILDING (4800)
- 2 AIRCRAFT CONSTRUCTION AND MODIFICATION HANGAR (4801)
- 3 MAIN HANGAR (4802)
- 4 AIRCRAFT TIRE REPAIR SHOP (4803)
- 5 TRAILER PARK AND MODULAR BUILDINGS
- 6 BOILER HOUSE (4886)
- 7 SHOPS (A.G.E., MODEL, BATTERY, GARAGE) (4806)
- 8 STORAGE BUILDING (4807)
- 9 WAREHOUSE NO 2 (4808)
- 10 WAREHOUSE NO 3 (4809)
- 11 WAREHOUSE NO 4 (4810)
- 12 FLIGHT LOADS RESEARCH BUILDING (4820)
- 13 PAINT SPRAY BUILDING (4821)
- 14 PAINT STORAGE BUILDING (4822)
- 15 COMMUNICATIONS BUILDING (4824)
- 16 MAINTENANCE DOCK (4826)
- 17 WOOD SHOP (4830)
- 18 WAREHOUSE NO 5 (4831)
- 19 RADAR BUILDING (4870)
- 20 100 FT. TOWER, BORE SITE TARGET ASSEMBLY AND EQUIP. BUILDING (4887)
- 21 CENTRAL STANDBY ELECTRICAL POWER FACILITY (4889)
- 22 STORAGE BUILDING (4804)
- 23 AIRCRAFT SERVICING DOCK (4823)
- 24 FPS-16 RADAR FACILITY (4982)
- 25 WAREHOUSE NO 6 (4827)
- 26 100 FT. TOWER, BORE SITE TARGET ASSEMBLY AND EQUIP. BUILDING (4981)
- 27 SHUTTLE HANGAR (4833)
- 28 SHUTTLE SHOP (4834)
- 29 SHOP TRAILER COMPLEX (4854)
- 30 SHUTTLE MATING STRUCTURE (4860)
- 31 PROPELLANT FUEL AND OXIDIZER STORAGE AREA (4855)
- 32 INTEGRATED SUPPORT FACILITY (4825)
- 33 WAREHOUSE NO 7 (4832)
- 34 PAC TRAILERS
- 35 PUMP STATION NO 1 (4853)
- 36 TRAINING TRAILERS
- 37 GFSQ STDN SPACE SHUTTLE ALT FACILITY (4918)
- 38 RCA EARTH STATION (4917)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		DRYDEN FLIGHT RESEARCH CENTER		EDWARDS, CALIFORNIA	
FY 1981 ESTIMATE		LOCATION PLAN		PROJECT NO. 100-100-100	
DATE		BY		CHECKED	
APPROVED		NOTED		MSK-D-005-71	

HUGH L. DRYDEN FLIGHT RESEARCH CENTER FISCAL YEAR 1981 ESTIMATES



RPM 8-24

LANGLEY
RESEARCH CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATE

LANGLEY RESEARCH CENTER

DESCRIPTION

The Langley Research Center is located at Hampton, Virginia. It is situated between Norfolk and Williamsburg, Virginia, in the tidewater area of Hampton Roads. The Center utilizes 810 acres of Government-owned land, divided into two areas by the runway facilities of Langley Air Force Base. The West Area consists of 787 acres, all owned by NASA. The East Area comprises 23 acres under permit from the Air Force. Runways, some utilities and certain other facilities are used jointly by NASA and the Air Force. In addition, there are 110 acres of NASA-owned land located in the city of Newport News, Virginia, and 3,276 acres under permit from the Department of Interior. The total acreage presently owned, under permit, or leased, is 4,196. The total capital investment of the Langley Research Center, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1979, was \$566,553,000.

CENTER ROLES AND MISSIONS

Langley Research Center (LaRC) continues to play a major role in the development of aeronautics and space technology in the United States.

Langley has developed recognized areas of technical excellence within the civil service staff and facilities of superior merit; that is, major technical facilities which constitute a national resource. The principal and supporting roles are:

PRINCIPAL

Long-Haul Aircraft Technology - developing a technology base for improving long-haul aircraft as a cost effective, safe and environmentally compatible transportation mode.

General Aviation Aircraft Technology - developing and maintaining an engineering technology base related to improving general aviation aircraft.

Fundamental Aerodynamics - advancing the general state of the art, both theoretical and experimental.

Acoustics and Noise Reduction - conducting research and developing a technology base related to reducing aircraft noise.

Aerospace Vehicle Structures and Materials - developing a technology base for facilitating advances.

Avionics Technology - developing a technology base related to improving avionics.

Military Support - providing technical support to military aviation in areas consistent with other LaRC aeronautics roles and LaRC unique capabilities.

Advanced Space Vehicle Configurations Technology - developing a technology base related to advanced configurations, including advanced space transportation concepts.

Sensor and Data Acquisition Technology - developing a technology base for sensors and data acquisition devices.

Technology Experiments in Space - developing and managing the Long Duration Exposure Facility. Defining and developing experiments in areas consistent with other LaRC space roles.

Environmental Quality Monitoring Technology - developing improved techniques for environmental monitoring. Includes research, experiment development/management, data analysis, and investigator management and specialized ground/aircraft investigations. Also includes development of Shuttle payloads related to environmental monitoring.

SUPPORTING

Rotorcraft Technology - contributing to the development of the technology base with emphasis on structures aeroelasticity, acoustics, noise, and avionics components.

Hypersonic Propulsion Systems - contributing to the technology base of air breathing propulsion systems by advancing the state of the art of hypersonic propulsion.

Planetary Entry Technology - providing planetary and earth entry aerothermodynamics experimental and analytical data.

Computational Fluid Dynamics - contributing to the software technology base.

Upper Atmospheric Research - mission analysis, sensor development, data interpretation and utilization for remote sensing; contributing to model development.

Launch Vehicle Procurement - develop and procure for science/applications missions, including Scout launch vehicle.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	<u>1979</u> <u>Actual</u>	<u>1980</u> <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>1981</u> <u>Budget</u> <u>Estimate</u>
I. Personnel and Related Costs.....	88,191	89,940	95,405	95,782
II. Travel.....	1,947	2,154	1,899	2,021
III. Facilities Services.....	8,803	10,192	10,914	12,537
IV. Technical Services.....	2,296	2,032	1,802	2,453
V. Management and Operations.....	<u>5,406</u>	<u>5,940</u>	<u>6,020</u>	<u>6,352</u>
Total, fund requirements.....	<u>106.643</u>	<u>110.258</u>	<u>116.040</u>	<u>119.145</u>

Distribution of Permanent Positions by Program

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	<u>Current Estimate</u>	1981 <u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>50</u>	<u>44</u>	<u>47</u>	<u>44</u>
Space shuttle.....	13	4	5	2
Expendable launch vehicles.....	37	40	42	42
<u>Space and Terrestrial Applications</u>	<u>243</u>	<u>223</u>	<u>220</u>	<u>220</u>
Space applications.....	225	211	202	204
Technology utilization.....	18	12	18	16
<u>Aeronautics and Space Technology</u>	<u>1,987</u>	<u>1,983</u>	<u>1,997</u>	<u>2,005</u>
Aeronautical research and technology.....	1,430	1,470	1,471	1,482
Space research and technology.....	<u>557</u>	<u>513</u>	<u>526</u>	<u>523</u>
Subtotal, direct positions.....	2,280	2,250	2,264	2,269
<u>Center Management and Operations Support Positions</u>	<u>725</u>	<u>740</u>	<u>716</u>	<u>711</u>
Total, permanent positions.....	<u>3,005</u>	<u>2,990</u>	<u>2,980</u>	<u>2,980</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE SHUTTLE..... 2

In 1981, civil service personnel will continue to work on test and evaluation of propellant dynamics.

EXPENDABLE LAUNCH VEHICLES..... 42

The expendable launch vehicle program at Langley provides centralized procurement of the Scout Launch Vehicle. In 1981, civil service personnel will support a program which includes the procurement of launch vehicle hardware, launch services, engineering, and maintenance.

The 1981 launches under this program will be conducted from sites located at the Western Test Range in California, and the San Marco platform off the coast of Kenya, Africa.

SPACE APPLICATIONS..... 204

The space applications program at Langley is characterized by a research capability that is a national resource for understanding environmental problems and for developing related monitoring systems. The Center's technical expertise is widely recognized in the areas of remote sensing of the Earth's atmospheric trace species and analytical atmospheric modeling. In the area of Upper Atmospheric Research, Langley civil service personnel will continue to study the Earth's atmosphere to assess any changes caused by man and to determine whether or not there is any associated change in the transmission of solar radiation. Effort will be continued in the definition of experiments for the Spacelab/Shuttle which will provide atmospheric measurements of trace constituent, clouds, aerosols, and temperature in the troposphere and stratosphere.

The Center's sensor development program encompasses the broadest possible range of advanced remote sensing techniques, including correlation gas filter radiometry and interferometry, laser heterodyne radiometry, and lidar.

A significant improvement in our understanding of man's impact on the stratosphere and climate will be obtained from the combination of Langley developed statistical/theoretical models and the comprehensive global data set provided by spaceborne sensors such as Nimbus-7, Stratospheric Aerosol and Gas Experiment (SAGE), and the Halogen Occultation Experiment (HALOE). The HALOE instrument will measure stratospheric species involved in ozone destruction by chlorine chemistry.

Studies of the Earth's radiation budget will be fundamental to the understanding of climate phenomena. Langley has the responsibility for the science, sensor development, and data management for the Earth Radiation Budget Experiment, a prime element in NASA's support of the National Climate Program. Preliminary radiation budget studies, based on Nimbus data, are examining the relationship of radiation budget to such climatological parameters as cloudiness; snow and ice cover, and sea surface temperature.

A unique Langley marine research capability of coupled laboratory tests, field tests, data processing algorithm and display development, and predictive model development has been demonstrated. The Langley program will provide the technology base for design of future integrated remote sensing systems for increasing our understanding of water pollution problems.

Permanent Positions
(Civil Service)

TECHNOLOGY UTILIZATION..... 16

The overall objective of the NASA Technology Utilization program is to enhance economic growth and contribute to the technological solution of public problems through the transfer of new technology resulting from aeronautical and space research and development efforts to the non-aerospace segments of the economy.

In 1981, civil service personnel will provide the following support:

1. Expedite the application of new technology by compressing the time required from generation of technology to its use in the economy.
2. Encourage the use of aerospace technology in non-aerospace segments of the economy having problems amenable to technological solutions.
3. Understand more fully the technology transfer process and its impact and systematically manage and optimize the process.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 1,482

The aeronautical research and technology program at Langley is characterized by the dynamic interaction between a broad spectrum of technical disciplines, the application of discipline research to specific technology requirements, demonstrations of particular technology applications, and the indepth look at future technology requirements. The diversity of activities in such disciplines as materials, structures, flight stability and control, avionics, and aerodynamics provides the expertise to pursue the broader problems such as those involved in the terminal configured vehicle and aircraft energy efficiency technology programs. The unique wind tunnel and computing facilities at Langley compliment the expertise of the technical staff to produce a broad cohesive program in aeronautical research.

The aerodynamics activity at Langley encompasses extensive theoretical, experimental, and applications activities. Basic work in fluid and flight mechanics involves theoretical and experimental determination of

aerodynamic flows and complex aircraft motions. The program utilizes the unique Langley capabilities made possible by the STAR Computer and recently developed cryogenic wind tunnel testing techniques which provide the capability of simulating full-scale Reynolds numbers at transonic speeds.

Aspects of the problems which are studied include airfoil and wing design, flowfield analysis, configuration design processes, noise and analysis, propulsion system integration, fuel efficiency, flight dynamics, and economic feasibility. Tunnel testing techniques will be further enhanced by combining the technology developed for non-optical positioning sensing of models with the superconducting coil technology to provide for the design and construction of an advanced magnetic balance and suspension system. The STAR Computer will be used in the areas of far-field jet noise, 3-D potential flow programs, and in the solution of 2-D and 3-D Navier-Stokes equations. Generation and documentation of the aerodynamic behavior of new airfoils will be furthered by the continued definition of the aerodynamic characteristics of a range of supercritical airfoils. Application of advanced transonic theories to the design of improved 3-D wings will be continued and evaluated by wind tunnel tests. Wind tunnel and flight tests will be continued on general aviation aircraft configurations having the potential for practical stall immunity and means for spin avoidance. An improved data base for the aircraft noise prediction computer program will be developed so that noise contours can be predicted within 1.5dB accuracy. Other activities in the acoustics and noise reduction research include research on jet noise, duct acoustics, forward speed effects on fan noise, interior noise, rotating blade noise, atmospheric propagation, noise predictions, and community impact and annoyance produced by aircraft noise. Transport and General Aviation Operations Research will add to aircraft safety and productivity. In the area of aircraft energy efficiency technology, major activities include continuation of work required for the design and testing of a laminar flow control wing box, cover panel and ducting, and for the design of a laminar flow control compatible supercritical airfoil section for flight test evaluation; the establishment of design data for high aspect ratio supercritical wings; investigations of high lift aerodynamics configurations for advanced transports; and the evaluation of performance benefits achievable by incorporating winglets and wing tip extensions to wide-body transports. This technology also has application to improved mission performance for general aviation aircraft and for advanced maneuvering air combat aircraft and missile systems and is being investigated in relation to subsonic, supersonic, and hypersonic configuration concepts. In the area of supersonic configurations, improved aerodynamic platforms will be experimentally determined by subsonic, transonic, and supersonic wind tunnel tests.

The materials and structures effort is directed at the development of new and improved structural materials, manufacturing processes, and design technology to improve the structural efficiency, reliability, and durability and to reduce design costs of airframes and components. This activity is focused on research on advanced composite materials, computer aided analysis and design technology, and development of analytical or semiempirical fatigue and life prediction methodology. Use of active controls for minimization of aeroelastic response, reduced static stability, and minimization of gust and maneuver loads is being pursued in both theoretical and wind tunnel studies.

Emerging technological advances in computer systems will continue to be exploited to significantly increase the utility and reduce the cost of engineering computations. A finite element computational device using microprocessor components will be defined in 1981 that is capable of reducing computational costs and/or times by a factor of ten over present devices.

The avionics work at Langley includes technology development in aircraft guidance and navigation, aircraft control systems, crew station avionics, and integration and interfacing techniques. Also, major efforts in aircraft flightpath management and operations technology and active controls technology for conventional takeoff and landing (CTOL) are being conducted in this program area. The work includes requirements analyses, design studies, systems and component technology development, ground simulation and technology validation, and proof-of-concept validation through experimental flight programs. The Langley expertise in the avionics area is being applied to terminal configured vehicle systems and operations technology, broadly applicable technology for development of low-cost Global Positioning System (GPS) navigation hardware and software, advanced control laws for various aircraft classes, intersystems communications networks for enhanced interfacing and integration of functions within an aircraft, and advanced technology for improved display media and pilot/system interfaces in aircraft cockpits. Emphasis in 1981 will be on investigations of the capacity, efficiency, and safety potential of cockpit-displayed air traffic information concepts with elements of an advanced air traffic control system, the development of technology for enhanced function and hardware integration to increase aircraft systems reliability and reduce operating costs, definition of requirements and technology to facilitate general aviation single-pilot guidance and control in Instrument Flight Regime (IFR) environments, and the investigation of concepts and technology which will result in highly accurate aircraft navigation capability utilizing the GPS. Other avionics technology applications are also found in work on advanced digital flight control systems, fluidics instrumentation for general aviation aircraft, and the development of mathematical tools to investigate and enhance reliability prediction and assessment, control algorithm design, and pilot describing functions.

Permanent Positions
(Civil Service)

SPACE RESEARCH AND TECHNOLOGY.....

523

The space research and technology program at Langley is characterized by work in several discipline areas and the application of this discipline expertise to current and future technology requirements. Longer range studies are directed at defining the technology requirements for future space systems and missions.

The objective in the materials area is to establish and demonstrate the required technology for application of advanced materials for a wide variety of space applications. Material systems and applications include: high temperature composites with long life capability for use as structural materials in future space

transportation systems; high temperature metallic materials for thermal protection systems; and high stiffness, low weight, low thermal expansion composites for large, long-life space structures. Environmental effects on the mechanical and physical properties of materials are being studied utilizing specialized facilities and laboratories. An integral part of the research activity is the definition of new experimental testing and research facility requirements which will assure that the reliability and durability of future space structures can be adequately predicted and assessed.

The goal of the activities in the area of structures is to provide validated analysis and design methodology, design concepts, and dynamics and control methodology required for efficient long-life space transportation and payload structures. High temperature metallic heat shield concepts and actively cooled structural and propulsion concepts for advanced Space Transportation Systems are being derived and evaluated using specialized laboratories and wind tunnels. A complete radiation heat transfer, large deflection, and nonlinear materials property analysis capability will be available in 1981. Analysis, design, and loads determination methodology for deployable and erectable large space platforms, antennae, and booms are being studied as part of a multi-Center, multidisciplinary program for advanced technology. By mid-1982, an improved structural analysis methodology for substantially improved computational efficiency will be developed and verified. It will include the effects of plasticity, large deflections, large rotations, and other sources of nonlinear behavior, and will require application of evolving advanced numerical techniques, computer software and computer hardware ■

An extensive program in electronic component technology development, data processing and sensor development is conducted at Langley. Sensor developments include laser back-scatter and fluorescence techniques for water quality measurements, continuously tuneable infrared laser techniques, and high power/high pressure tuneable gas lasers for the measurement of low concentration atmospheric constituents. In 1981, Langley will complete design and analysis studies to meet the requirements for fabrication of a solar occultation Laser Heterodyne Spectrometer experiment to measure stratospheric constituents in the 9-12um region, and will design and evaluate an array of microwave radiometer receivers for high resolution (+1 km) oceanographic sensing.

Specific devices required to support the development of a charged coupled device onboard data processor are being developed and evaluated. The broad objective of this work is to develop an onboard processor technology base for remote sensing vehicles with the potential of leading to a 1,000-fold decrease in the density of data sent back to Earth processing stations. The evaluation of a solid state data storage system using bubble domain technology is underway at Langley. The overall objective is to provide an adequate bit solid state data storage system suitable for replacing tape recorders in many aerospace vehicle applications. Other space electronics technology efforts are focused on detectors for remote sensing (e.g., infrared and pyroelectric devices), spacecraft attitude control (using magnetically suspended momentum storage or vernier pointing devices), and multipurpose, user-oriented, software development verification and validation techniques.

The objectives of the Langley program in entry technology are to develop the aerothermodynamic technology required for the design and operation of advanced vehicle systems for space and global transportation, and to provide Space Shuttle support. The objectives are being met through the application of analytical techniques and unique Langley facilities in the areas of Earth orbit transportation, aerodynamics, heat transfer, real gas effects, planetary entry, radiative heating and hypervelocity gas dynamics. Theoretical and experimental efforts in the areas of ablation product radiation and absorption, highly blown shock layer probe flight mechanics, and mass loss and shape change will be pursued to develop a sufficient data base to minimize planetary mission cost, maximize scientific return and ensure a high probability of mission success.

The Langley programs in Space Technology Shuttle Payloads involve a variety of tasks focused on extending basic research and technology development into the space environment when economically feasible, and/or when the objectives can be achieved only in space.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 711

Center Management and Operations Support is defined as that support or service being provided to all Langley Research Center organizations which cannot be directly identified to a benefiting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and immediate staff; e.g., Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Reliability and quality assurance
- Custodial services
- Logistics support including transportation, supplies, etc.
- Photographic and graphic support

<u>RESOURCE</u>		<u>EXPENSES BY FUNCTION</u>			
		1979	1980		1981
		<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
			<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
			(Thousands of Dollars)		
I.	<u>PERSONNEL AND RELATED COSTS</u>	<u>88,191</u>	<u>89,940</u>	<u>95,405</u>	<u>95,782</u>
<u>Summary of Fund Requirements</u>					
A	<u>Compensation and Benefits</u>				
1.	<u>Compensation</u>				
a.	Permanent positions.....	78,275	79,276	84,270	84,321
b.	Other than full-time permanent positions.	1,114	1,211	1,441	1,491
■	Overtime and other compensation.....	<u>516</u>	<u>597</u>	<u>632</u>	<u>632</u>
	Subtotal, Compensation.....	79,905	81,084	86,343	86,444
2.	<u>Benefits</u>	<u>7,706</u>	<u>8,161</u>	<u>8,367</u>	<u>8,603</u>
	Subtotal, Compensation and Benefits.....	<u>87,611</u>	<u>89,245</u>	<u>94,710</u>	<u>95,047</u>
B	<u>Supporting Costs</u>				
1.	Transfer of personnel	60	105	66	66
2.	Personnel cost	<u>520</u>	<u>590</u>	<u>629</u>	<u>669</u>
	Subtotal ■ Supporting Costs.	<u>580</u>	<u>695</u>	<u>695</u>	<u>735</u>
	Total, Personnel and Related Costs..	<u>88,191</u>	<u>89,940</u>	<u>95,405</u>	<u>95,782</u>

Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u>*	87,611	89,245	94,710	95,047
1. <u>Compensation</u>	79,905	81,084	86,343	86,444
a. <u>Permanent positions</u>	78,275	79,276	84,270	84,321

The funds shown above will support 2,980 permanent positions in 1981. The increase in cost from the 1980 budget estimate to the 1980 current estimate is due primarily to the October 1979 pay increase, partially offset by savings from the reduction of 10 permanent positions.

Basis of Cost for Permanent Positions

In 1981 the cost of permanent positions will be \$84,321,000, an increase of \$51,000 over 1980. This increase results from the following:

Cost of permanent positions in 1980.....	84,270
Cost increase in 1981.....	+1,539
Within grade and career advances:	
Full year effect of 1980 actions.....	+681
Partial year effect of 1981 actions.....	+764
Full year effect of 1980 pay increases.....	+94
Cost decreases in 1981.....	-1,488
Turnover savings and abolished positions:	
Full year effect of 1980 actions.....	-668
Partial year effect of 1981 actions.....	-504
One less paid day in 1981.....	-316
Cost of permanent positions in 1981.....	<u>84,321</u>

	1979	1980		1981
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent positions				
1. Cost.....	1,114	1,211	1,441	1,491
2. Workyears.....	121	137	144	148

The 1981 distribution of workyears is as follows:

<u>Distribution of Other than Full-Time Permanent Workyears</u>	
<u>Program</u>	<u>Workyears</u>
Cooperative training.....	80
Summer employment.....	18
Opportunity programs.....	39
Other temporary employment.....	<u>11</u>
Total.....	<u>148</u>

The increase from the 1980 budget estimate to the 1980 current estimate reflects the continuation of the part-time employment program and the institution of the White House Research Apprenticeships program. The increase from the 1980 current estimate to the 1981 estimate is due to the scheduled build-up of the Research Apprenticeships program.

c. Overtime and other compensation.....	516	597	632	632
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The use of overtime and other compensation is limited to emergency repairs and work that cannot be accomplished during normal working hours. This includes the monitoring of on-site contracts being performed during off-duty hours and wind tunnel work required at night to take advantage of off-peak rates. The increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the October 1979 pay increase.

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
2 <u>Benefits</u>	<u>7,706</u>	<u>8,161</u>	<u>8,367</u>	<u>8,603</u>
Following are the amounts of contribution by category:				
Civil Service Retirement Fund.....	5,492	5,680	5,953	6,010
Employee life insurance.....	245	349	284	298
Employee health insurance.....	1,619	1,803	1,732	1,850
Workmen's compensation.....	301	300	363	405
FICA.....	23	29	35	40
Severance pay.....	<u>26</u>	<u>---</u>	<u>---</u>	<u>---</u>
Total.	<u>7,706</u>	<u>8,161</u>	<u>8,367</u>	<u>8,603</u>

The increase from the 1980 budget estimate to the 1980 current estimate is due primarily to the October 1979 pay increase, partially offset by the savings from the reduction of 10 permanent positions. The increase in 1981 over the 1980 current estimate is related to the increases in personnel compensation. The workmen's compensation costs are based on the Department of Labor billings for 1980 and 1981.

0. <u>Portion to</u>	<u>580</u>	<u>695</u>	<u>695</u>	<u>735</u>
1. <u>Transfer of personnel</u>	60	105	66	66

Transfer of personnel costs include actual expenses involved in the movement and temporary storage of employees' household goods, subsistence and temporary expenses, real estate costs, and miscellaneous moving expenses. The current 1980 and 1981 estimate reflect 1979 experience.

2. <u>Personnel training</u>	520	590	629	669
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The increase from the 1980 budget estimate to the 1980 current estimate is due to announced tuition increases and requirements for Civil Service Reform Act implementation training. The 1981 estimate assumes the same level of effort as 1980.

	1979 Actual	1980 Budget Estimate Current Estimate (Thousands of Dollars)		1981 Budget Estimate
II. <u>TRAVEL</u>	<u>1,947</u>	<u>2,154</u>	<u>1,899</u>	<u>2,021</u>

Summary of Fund Requirements

A. Program Travel.....	1,381	1,478	<u>1,478</u>	1,573
B. Scientific and Technical Development Tr	249	265	265	282
C. Management and Operation Tr	<u>317</u>	<u>411</u>	<u>156</u>	<u>166</u>
Total, Tr	<u>1,947</u>	<u>2,154</u>	<u>1,899</u>	<u>2,021</u>

Explanation of Fund Requirements

A. <u>Program Tr.....</u>	<u>1,381</u>	<u>1,478</u>	<u>1,478</u>	<u>1,573</u>
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Program travel is directly related to the accomplishment of the Center's mission. Travel for program purposes reflects the continuing effort in space research, aircraft technology, flight simulation, fluid mechanics, airborne science and applications, and space applications. The 1981 estimate provides for essentially the same level of travel activity as in 1980.

B. <u>Scientific and Technical Development Tr.....</u>	<u>249</u>	<u>265</u>	<u>265</u>	<u>282</u>
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Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside LaRC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. The 1981 estimate provides for essentially the same level of travel activity as in 1980.

C. <u>Management and Operations Tr.....</u>	<u>317</u>	<u>411</u>	<u>156</u>	166
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the

Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The 1981 estimate provides for essentially the same level of travel activity as in 1980.

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 Budget <u>Estimate</u>
111. <u>FACILITIES SERVICES</u>	<u>8,803</u>	<u>10,192</u>	<u>10,914</u>	<u>12,537</u>

Langley Research Center (LaRC) is located on 787 acres of grounds in a complex made up of laboratory and office type buildings as well as research wind tunnels.

This complex encompasses 2,074,145 gross square feet of building space including 11 major buildings. Also included are 18 major technical facilities. This physical plant houses an average daily on-Center population of 4,200 to 4,500 personnel. Many of the test facilities are utilized on more than one shift/or during off peak hours.

Summary of Fund Requirements

A. Maintenance and Related Services

1. Facilities..	649	624	680	759
B. <u>Custodial Services</u>	1,753	1,980	1,980	2,329
C. <u>Utility Services</u>	<u>6,401</u>	<u>7,588</u>	<u>8,254</u>	<u>9,449</u>
Total, Facilities Services.... ..	<u>8,803</u>	<u>10,192</u>	<u>10,914</u>	<u>12,537</u>

Explanation of Fund Requirements

A. Maintenance and Related Services

1. Facilities	649	624	680	759
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This activity provides funds for maintenance and repair of aging administrative facilities and utility lines. This activity also provides for 12 workyears of effort to accomplish grounds maintenance. The increase in the 1980 current estimate over the 1980 budget estimate is to accommodate work deferred from 1979. The 1981 request reflects a continuation of the 1980 maintenance and repair effort at approximately the same level.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
B. <u>Custodial Services</u>	<u>1,753</u>	<u>1,980</u>	<u>1,980</u>	<u>2,329</u>

This activity involves 108 workyears of effort at LaRC to provide for janitorial and security services. Also included are funds for fire protection services provided by the city of Hampton. Estimates for 1980 current and 1981 are based upon recently concluded wage increases for janitors and security guards. The 1981 estimate provides for the full year affect of wage increases negotiated in 1980. Services remain at the current level.

C. <u>Utilities Services</u>	<u>6,401</u>	<u>7,588</u>	<u>8,254</u>	<u>9,449</u>
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Included in this item is the purchase of electric service from Virginia Electric and Power Company (VEPCO), fuel oil from a local supplier, and water and sewage charges. Also included are funds for heat and steam services from the USAF-Langley for East area facilities and, beginning in 1981, purchase of steam from the city of Hampton for facilities located in the West area of LaRC.

A breakdown of the utilities costs is as follows:

1. Electricity (138,000 mWh).....	7,307
2. Fuel oil (1,265,000 gals.)	569
3. Heat and steam (USAF)	247
4. Water and sewage.....	102
5. Steam (City of Hampton)	1,224

The increase in the 1980 current estimate over the 1980 budget estimate is the result of recent VEPCO rate increases. The 1981 estimate reflects a reduction of 12 million kilowatt hours of electricity due to revised programmatic requirements. All other estimates reflect the full year effect of 1980 rate increases.

	1979	1980		1981
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
IV. <u>TECHNICAL SERVICES</u>	<u>2,296</u>	<u>2,032</u>	<u>1,802</u>	<u>2,453</u>

Summary of Fund Requirements

A. Automatic Data Processing

1. Equipment	467	311	86	270
2. Operations	<u>1,346</u>	<u>1,368</u>	<u>1,333</u>	<u>1,745</u>
Subtotal	<u>1,813</u>	<u>1,679</u>	<u>1,419</u>	<u>2,015</u>

B. Scientific and Technical Information

1. Library	125	101	136	142
2. Education and Information	<u>358</u>	<u>252</u>	<u>247</u>	<u>296</u>
Subtotal	<u>483</u>	<u>353</u>	<u>383</u>	<u>438</u>
Total, Technical Services.	<u>2,296</u>	<u>2,032</u>	<u>1,802</u>	<u>2,453</u>

Explanation of Fund Requirements

A. <u>Automatic Data Processing</u>	<u>1,813</u>	<u>1,679</u>	<u>1,149</u>	<u>2,015</u>
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Funds for the Center's business computer complex which provides the accounting and management information data required by the Center and NASA are provided for in this function. Included are equipment lease, purchase and maintenance; paper and other expendable supplies; small miscellaneous contracts; and a 33 work-year level of effort support service contract for programming and operations.

1. Equipment	467	311	86	270
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This activity includes the lease and purchase of equipment associated with Langley's business computer complex. The reduction in the 1980 current estimate from the 1980 budget estimate is due to the acquisition of items in 1979 that had originally been planned for 1980. The 1981 estimate reflects a level of routine equipment replacement and update.

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> (Thousands of Dollars)	1980 <u>Current Estimate</u> (Thousands of Dollars)	1981 <u>Budget Estimate</u>
2. Operations.....	1,346	1,368	1,333	1,745
<p>This estimate includes ADP equipment maintenance, supplies, and the support service contract for programming and operations. The reduction in the 1980 current estimate from the 1980 budget estimate is due to the postponement of minor program updating until 1981. The 1981 estimate also reflects the full year cost of support service contract rate increases anticipated in 1980.</p>				
B. <u>Scientific and Technical Information</u>	483	353	383	<u>438</u>
<p>This estimate provides support service contract assistance in the operation of the technical library and Visitor Information Center. Also included are funds for public information services. The slight increase in the 1980 current estimate over the 1980 budget estimate is due to the addition of several acquisitions deferred from 1979. The 1981 estimate reflects activity approximately level with the 1980 effort.</p>				
1. Library	125	101	136	142
<p>Nine workyears of support contract effort are for the operation of the Center's technical library. The increase in the 1980 current estimate is due to the increase of one support service contract workyear and increased wage rates. The 1981 estimate reflects the same level of effort provided in 1980.</p>				
2. Education and information.....	358	252	247	296
<p>Funding for all the Center's public affairs activities is included in this estimate. Included are nine workyears of support contract effort for operation of the Visitor Information Center; coordination of tours and special events; construction and transportation of exhibits; and other miscellaneous educational and information programs. The reduction in the 1980 current estimate from the 1980 budget estimate is due to the movement into 1979 of several small purchases originally planned for 1980. The 1981 estimate reflects a level of operations approximately equal to the 1980 effort.</p>				

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>5.406</u>	<u>5.940</u>	<u>6.020</u>	<u>6.352</u>

Summary of Fund Requirements

A. Administrative Communications	1,079	1,182	1,187	1,377
B. Printing and Reproduction.....	157	177	182	193
C. Transportation.....	1,313	1,360	1,422	1,568
D. Installation Common Services	<u>2,857</u>	<u>3,221</u>	<u>3,229</u>	<u>3,214</u>
Total, Management and Operations	<u>5.406</u>	<u>5.940</u>	<u>6.020</u>	<u>6.352</u>

Explanation of Fund Requirements

A. <u>Administrative Communications</u>	<u>1,079</u>	<u>1,182</u>	<u>1,187</u>	<u>1,377</u>
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This estimate includes funds for local telephone and exchange costs; Federal Telecommunications System (FTS) service; and datafax and telegraph service. The increase in the 1980 current estimate over the 1980 budget estimate is due to an increase in service rates. The 1981 estimate provides for the full year effect of rate increases for communication services.

1. Local telephone service.....	870
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This estimate provides for local telephone and exchange costs. The 1981 estimate provides for the full year effect of rate increases.

2. Long distance telephone services.....	492
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These funds provide for long distance telephone service for the FTS. The 1981 estimate provides for the full year effect of rate increases for this service.

3. Other communications services.....	15
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Included in this activity are costs for other miscellaneous communications such as teletype and datafax services. The 1981 estimate provides for the full year effect of rate increases for these services.

	1979 <u>Actual</u>	1980 <u>Budget'</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u>	1981 <u>Budget</u> <u>Estimate</u>
B. <u>Printing and Reproduction</u>	157	177	182	<u>193</u>

This estimate provides for special printing and reproduction supplies, and a four workyear support service contract effort for reproduction services. The increase in the 1980 current estimate over the 1980 budget estimate is due to an increase in support service contract wage rates. The 1981 estimate provides for the full year effect of a previously negotiated wage increase in support service contract costs.

C. <u>Transportation</u>	<u>1,313</u>	<u>1,360</u>	<u>1,422</u>	<u>1,568</u>
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This activity includes the operation, maintenance, and purchase of motor vehicles; shipping transportation and freight charges; a 41-workyear support service contract effort for pickup and delivery of freight furniture, and other bulk objects; and a seven-workyear support service contract effort for operation and maintenance of the NASA-1 aircraft. This effort also includes all of the NASA-1 aircraft fuel, equipment, and expendable supplies. The increase in the 1980 current estimate over the 1980 budget estimate is due to an increase in support service contract wage rates. The 1981 estimate provides for the full year effect of the support contractor wage increases and the full year effect of rate increases for other services.

D. <u>Installation Common Services</u> ..	<u>2,857</u>	<u>3,221</u>	<u>3,229</u>	<u>3,214</u>
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These funds will provide for 77 workyears of support service contract effort for medical services, mail delivery, stock issue and warehousing, and other general administrative support. Also included are the rental and maintenance of office copy machines and equipment, minority programs, and other administrative services and supplies. The 1981 estimate provides for a slightly reduced level of service from that provided in the 1980 current estimate.

1. Center management and staff	343
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This function includes 13 workyears of support service contract effort and general supplies and equipment purchases for all administrative support organizations at the Center. The 1981 estimate reflects the full year effect of previously negotiated wage rate increases in support contract costs.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. Medical services... ..				432
<p>This function provides 11 workyears of effort for occupational and environmental health services, included are dispensary services; emergency ambulance service; medical examinations; and health physics and industrial hygiene services. The 1981 estimate provides for the full year effect of a previously negotiated increase in the cost of support contractor medical services.</p>				
3. Installation support services.....				2,439
<p>This function includes 53 workyears of support service contract effort for mail delivery, stock issuance and warehousing operations and micrographics services. Also included are the purchase, maintenance, and rental of office copy machines, typewriters and other office equipment, and postage costs. The 1981 estimate provides for the full year effect of a previously negotiated increase in cost of support contractors.</p>				

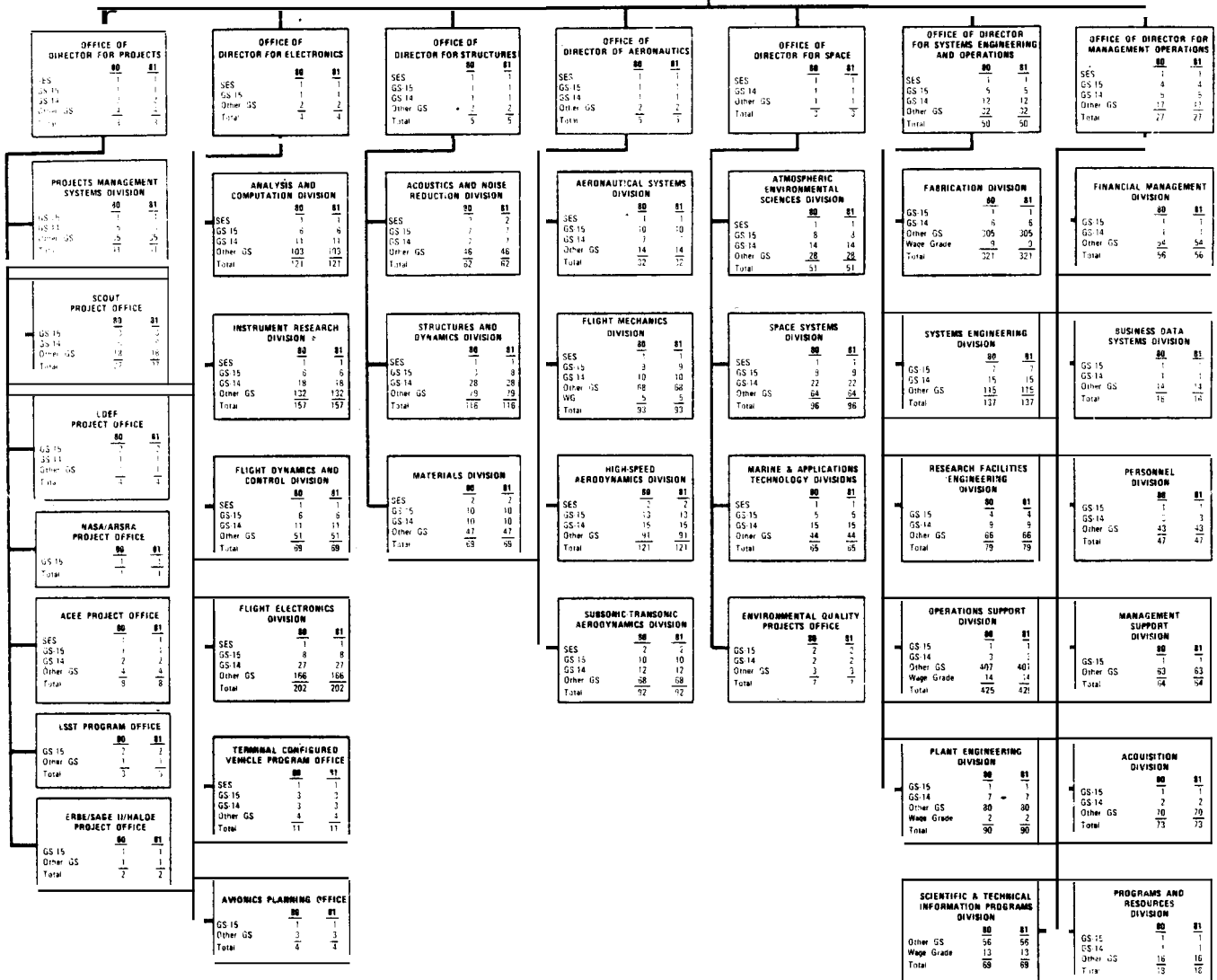
LANGLEY RESEARCH CENTER

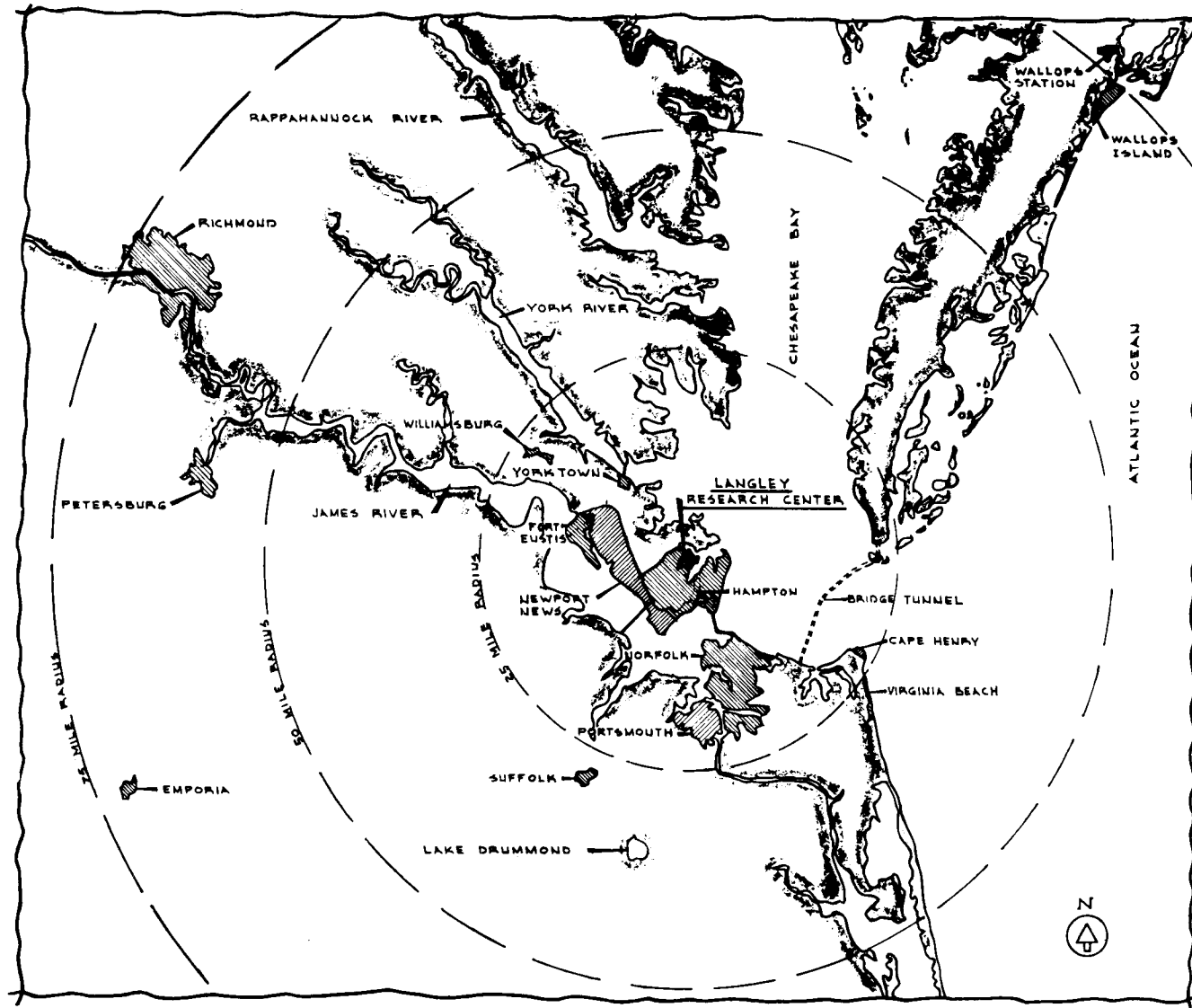
RPM 9-23

DECEMBER 4, 1979

STAFFING SUMMARY			
	80	81	
SES	30	27	
EX	2	2	
GS 15	166	165	
GS 14	298	298	
Other GS	2441	2440	
Wage Grade	43	13	
Total	2980	2980	

OFFICE OF DIRECTOR			
	80	81	
SES	1	1	
EX	1	1	
GS 15	1	1	
GS 14	2	2	
Other GS	2	20	
Total	7	25	

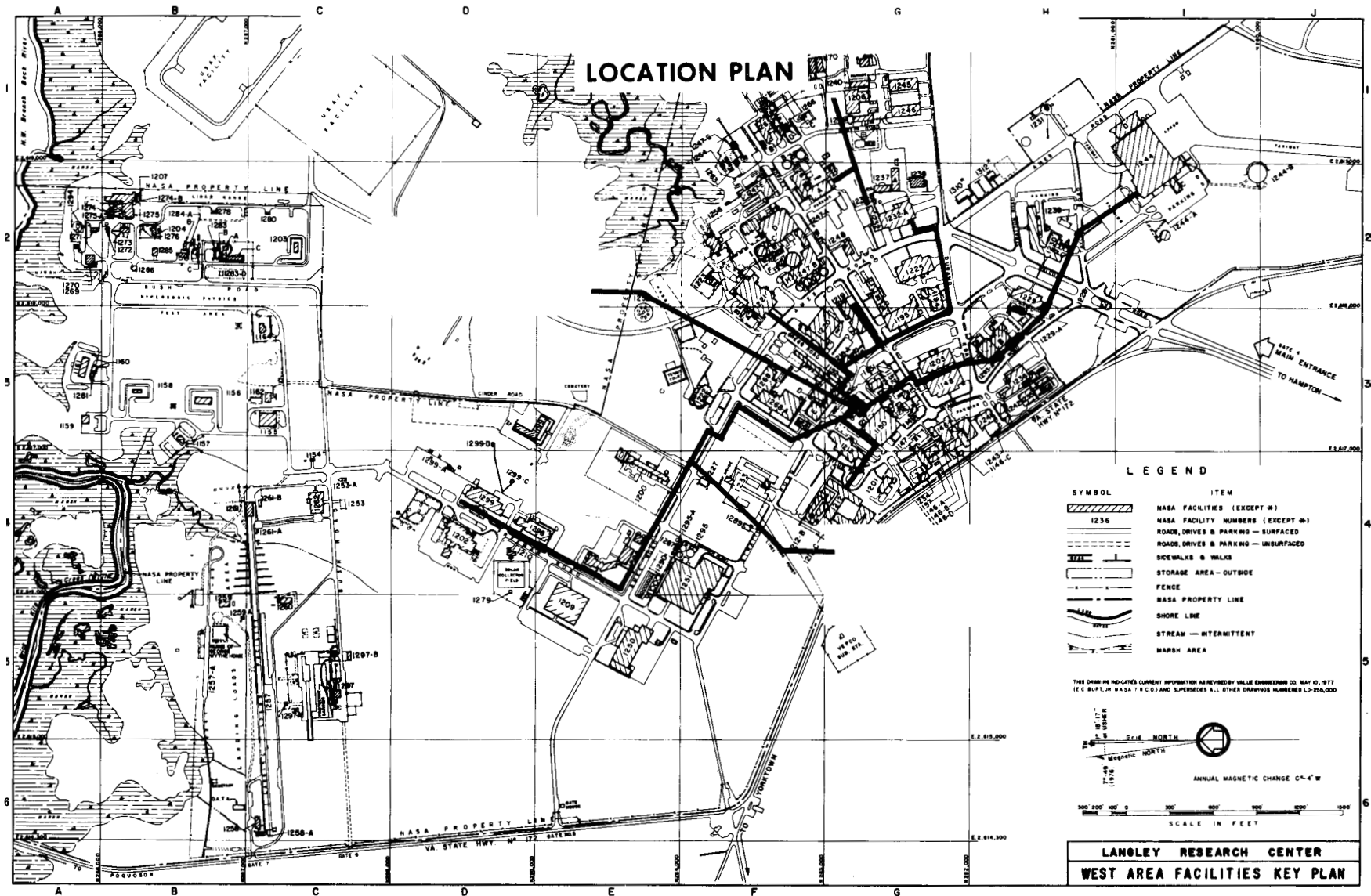




LANGLEY RESEARCH CENTER AND VICINITY

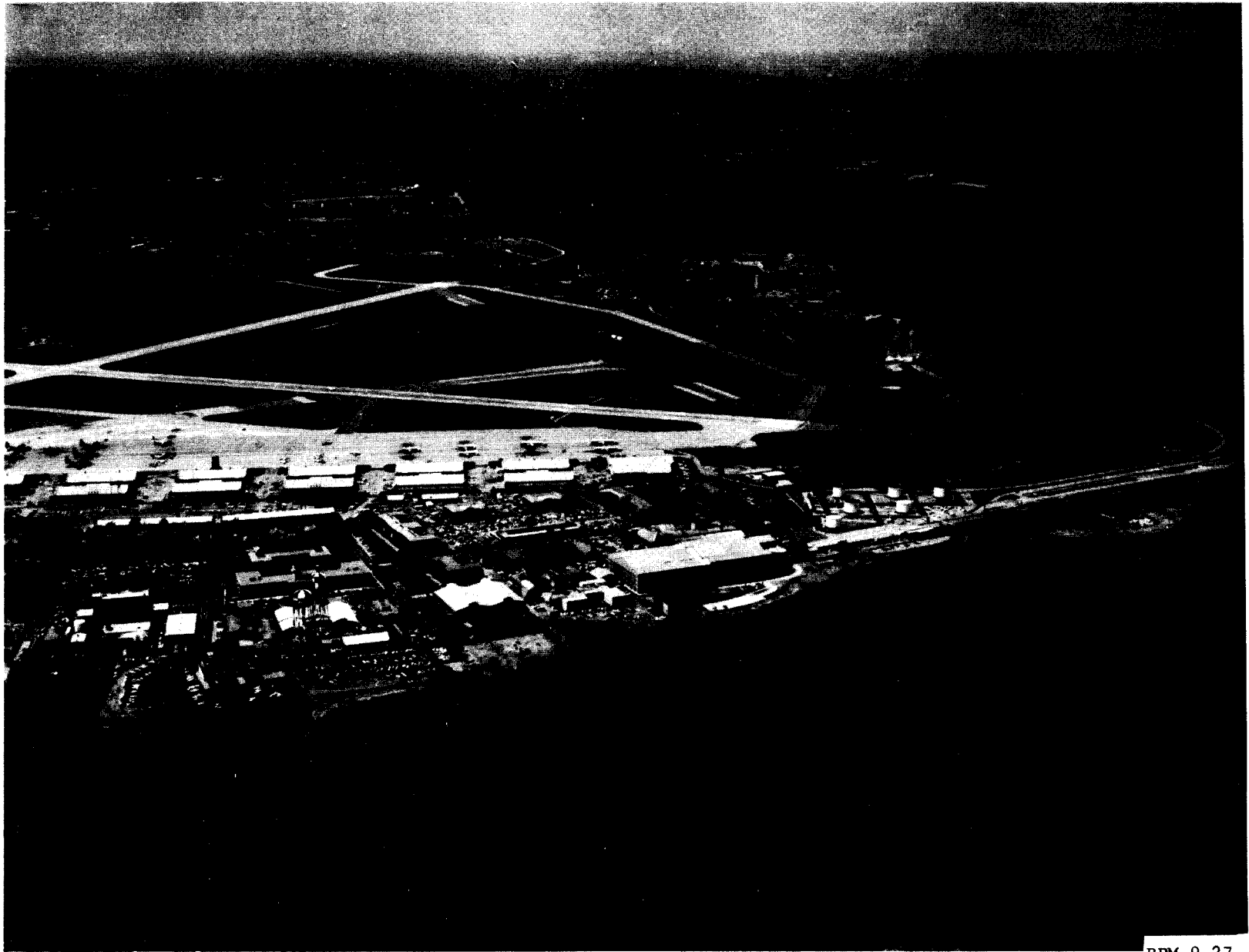
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LANGLEY RESEARCH CENTER
FISCAL YEAR 1981 ESTIMATES





RPM 9-26



RPM 9-27

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

LEWIS RESEARCH CENTER

DESCRIPTION

The Lewis Research Center occupies two sites in north central Ohio. The original site, established in 1941 adjacent to the Cleveland-Hopkins International Airport, has 366 acres including 14 acres leased from the City of Cleveland. There are over 100 buildings and structures, including wind tunnels, test chambers, laboratories and other research facilities.

The Plum Brook Station, established in 1956, is located south of Sandusky, Ohio, about 50 miles west of Cleveland, on land formerly occupied by the Plum Brook Ordnance works. There are 5,853 acres owned and approximately 47 acres in easements. There are 69 buildings and 99 concrete storage bunkers. A 100 KW Electric Wind Turbine Generator Facility designed to be operated remotely is in operation for a program jointly sponsored by the Department of Energy and NASA. During 1975, consistent with our future research and technology needs, the principal facilities were placed in a standby mode.

The total capital investment of the Lewis Research Center and the Plum Brook Station, including fixed assets in progress and contractor-held facilities at various locations as of September 30, 1979, was \$449,036,000.

CENTER ROLES AND MISSIONS

The Lewis Research Center was established in 1941 as an aircraft engine research laboratory to meet immediate wartime needs for superior aircraft propulsion systems. Since then, Lewis has developed and constructed many outstanding facilities for testing full-scale aircraft engines and engine components, chemical rocket engines, electric propulsion, space and terrestrial power generation systems and space communication systems. The principal and supporting roles are:

PRINCIPAL

Aeronautics - Development of an advanced technology base for high performance civil and military aircraft propulsion systems within environmental, safety and energy constraints. Development of a technology base to advance the state of the art in aeronautical propulsion systems and components, including engine noise reduction, high temperature materials and structures, improved engine efficiency, pollution control, computational fluid mechanics and technical support to military aviation programs.

Launch Vehicle Procurement - Management and operation of the Centaur launch vehicle system for scientific and applications missions for Government and commercial users.

Space Propulsion Systems Technology - Development and maintenance of the space propulsion systems technology base, including associated structures and materials work.

Space Energy Processes and Systems Technology - Development and maintenance of the technology base, including associated structures and materials work.

Energy Technology - Conducting energy-related research and development, primarily on a reimbursable basis, with broad emphasis on solar, gas turbine, ground propulsion and other appropriate terrestrial energy systems.

Communications Systems Technology - Development of communications technology, including high power microwave and millimeter-wave components and systems oriented towards satellite-based applications. Includes flight experiment development and management.

SUPPORTING

Environmental Observations - Development of remote sensing technology and systems for applications to water quality in the Great Lakes.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> (Thousands of Dollars)	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
I. Personnel and Related Costs.....	74,251	80,524	82,203	84,262
11. Travel.....	1,002	1,208	1,169	1,244
111. Facilities Services.....	9,565	10,894	11,312	12,307
IV. Technical Services.....	681	429	885	1,043
V. Management and Operations.....	<u>1,958</u>	<u>2,745</u>	<u>2,256</u>	<u>2,504</u>
Total, fund requirements.....	<u>87,457</u>	<u>95,800</u>	<u>97,825</u>	<u>101,360</u>

Distribution of Permanent Positions by Program

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation System</u>	<u>108</u>	<u>84</u>	<u>84</u>	<u>71</u>
Space flight operations.....	---	1	1	1
Expendable launch vehicles.....	108	83	83	70
<u>Space Science</u>	<u>5</u>	<u>-e-</u>	<u>---</u>	<u>---</u>
Planetary exploration.....	1	---	---	---
Life sciences.....	4	---	---	---

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
<u>Space and Terrestrial Applications</u>	<u>122</u>	<u>122</u>	<u>122</u>	<u>122</u>
Space applications.	111	111	111	111
Technology utilization.	11	11	11	11
<u>Aeronautics and Space Technology</u>	<u>1,967</u>	<u>1,969</u>	<u>1,969</u>	<u>1,982</u>
Aeronautical research and technology....	1,193	1,198	1,198	1,211
Space research and technology	378	375	375	375
Energy technology	<u>396</u>	<u>396</u>	<u>396</u>	<u>396</u>
Subtotal, direct positions	2,202	2,175	2,175	2,175
<u>Center Management and Operations Support Positions</u>	<u>656</u>	<u>660</u>	<u>660</u>	<u>660</u>
Total, permanent positions	<u>2,858</u>	<u>2,835</u>	<u>2,835</u>	<u>2,835</u>

PROGRAM DESCRIPTION

	<u>Permanent Positions (Civil Service)</u>
<u>SPACE FLIGHT OPERATIONS</u>	1

The Lewis Research Center provides scientific and engineering consultation and technical support for the Solar Electric Propulsion System being conducted by the Marshall Space Flight Center. The consultation and support is in the area of electrical propulsion systems, with special emphasis on ion field effects.

<u>EXPENDABLE LAUNCH VEHICLES</u>	70
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The Centaur Launch Vehicle program provides launch vehicles and launch operations for automated space missions. The program includes the procurement of vehicle systems hardware, launch services, engineering and management support as well as maintenance and operation of ground support equipment.

In 1981, civil service personnel working on the Centaur Launch Vehicle program will continue to support the launching of both Government and commercial payloads. Currently, three Atlas-Centaur launches and a back-up are scheduled in support of the Navy FLTSATCOM and the INTELSAT V program for COMSAT.

Permanent Positions
(Civil Service)

SPACE APPLICATIONS..... 111

Space Applications at the Lewis Research Center consists of space communications and environmental observations. In 1981, Lewis civil service personnel will continue to support these programs as follows:

Communications - Lewis, as the responsible Center for communications research and development, is studying the capabilities and costs of various advanced satellite communications systems concepts directed at providing additional frequency bands and improved communication service. The studies are being focused on the needs of the public and private sectors, both nationally and internationally. Lewis is working on experimental systems with possible application to both the ground and space segments of any future advanced communications systems. Lewis has begun a technology development program to expand the communication bands useable for communications in order to meet the increasing needs for additional frequencies. The principal focus of the program is the 20 to 30 gigahertz band. Additional research and technology efforts dealing with a wide range of frequency bands are also being conducted.

Environmental Observations - Carrying out its role of applying NASA's technology to regional needs, Lewis is developing and applying remote sensing technology to important areas of earth surface characteristics. Program milestones include verification of remote sensing data for organic and inorganic matter in the Great Lakes and completing the evaluation of coastal zone color scanner algorithms.

TECHNOLOGY UTILIZATION..... 11

In 1981, Lewis civil service personnel in the Technology Utilization program will be involved in transfer of new knowledge and innovative technology resulting from NASA R&D programs for application in industry, the public sector, and medicine. The primary objectives are to: (1) increase the return on the national investment in aerospace R&D; (2) shorten the time from discovery to application; (3) aid the movement of new knowledge to potential users; and (4) contribute to the development of improved means of transferring the new knowledge to other places of potential applications.

Permanent Positions
(Civil Service)

AERONAUTICS RESEARCH AND TECHNOLOGY.....

1,211

Lewis' major responsibility within aeronautics is propulsion. The general goal of Lewis is to provide the advanced technology base for developing high-performance civil and military aeronautical propulsion systems which are economical, fuel-conservative, and reliable, and which operate within minimum environmental impact. The civil service personnel in 1981 will be involved in conducting the ongoing program at the Center as described below:

In aeronautical propulsion-related research, the goal is to develop an understanding of the physical phenomena related to propulsion systems and components including aeroelasticity phenomena, computational fluid mechanics, low and high temperature composite materials, fatigue failure mechanisms, emission characteristics in reciprocating and turbine engines, alternate fuels characterization, noise generation mechanisms, and integrated control concepts.

The major goal in the components technology program is to advance the state of the art in engine components including composite fan blades, low aspect ratio compressor stages, core turbine cooling, blade clearance controls, advanced transmissions, prevaporizing combustors, two-dimensional nozzles, supersonic inlets, high and low speed propellers, bearings, seals, and instrumentation.

In engine systems technology, Lewis is studying problems encountered in complete engines and propulsion systems including engine performance at various altitudes, inlet flow distortion effects, dynamic component interactions, thrust augmentation, advanced control systems, techniques for reduced fuel consumption, engine emission and noise reduction, propulsion system-airframe interactions, aviation safety and icing research technology associated with propulsion systems.

Within the aeronautics program at Lewis, work is being performed on a number of major project areas including materials for advanced turbine engines, energy efficient engine, variable cycle engine, advanced low emissions combustors engine component improvement, quiet short-haul research aircraft, supersonic cruise research, advanced turboprops, advanced rotorcraft transmissions and broad specification fuels.

An extensive effort in materials and structures development supports the aeronautics propulsion program. The scope of this program involves both metallic and non-metallic materials and their application to advanced aircraft engines. Areas of emphasis include the development of alloys and matrix composites capable of higher operating temperatures, with longer operating lifetimes, and lower fabrication costs. The fatigue and fracture behavior of alloys under operating conditions and the development of operating life prediction techniques are an integral part of this materials development effort.

SPACE RESEARCH AND TECHNOLOGY.

375

The major roles of the Lewis Research Center in Space Research and Technology are to advance the state of the art and maintain a technology base for advanced propulsion and power systems, including associated materials and structures work and space power processing. In 1981, civil service personnel will be used in the activities described below.

The Lewis space propulsion programs include chemical and electric propulsion technology and component and systems development. The chemical propulsion program emphasizes advanced engine systems and components required for future space systems beyond the capability of the Space Shuttle. Improved components and methods of life prediction are being developed and demonstrated, advanced fuel-oxidant combinations are being tested, and complete engine systems tests are being conducted. Technology developments include advanced cooling techniques, fabrication techniques and materials for rocket chambers and nozzles, and advanced high pressure fuel/oxidant feed systems.

Electric propulsion supports both primary propulsion and auxiliary propulsion applications. The primary propulsion technology program consists of further thruster performance verification tests, performance testing of supporting power processor systems to deliver power to the thruster and its controls, and the integration testing of complete thruster systems, including the thruster, power processor, propellant storage and distribution system, thruster gimbal mechanism, controllers, and thermal control systems. Auxiliary electric propulsion meets spacecraft requirements for maneuvering, station keeping and altitude control. The present program objectives are to verify the performance of a one-millipound thruster, develop and test thruster power systems, and perform complete system verification tests.

Space power generation studies include solar photovoltaic and electrochemical energy conversion. The photovoltaic program is directed towards an improvement in solar cell efficiency, reduced cost, and improved operating life. Electrochemical research and development supports extended operating life and improved energy density for space batteries and fuel cell components and systems. Lewis is also conducting a program to advance the state of the art of microwave power amplifiers for potential future applications in communications and power transmission.

The interactions of the space plasma environment with high voltage power systems and components are being studied and technology is being developed to control these interactions and prevent power system failures.

The Lewis program in space materials technology emphasizes the development of improved materials for advanced space power generation, propulsion and communications systems. Studies include space environmental effects on superalloys and composites, and lubrication problems in mechanical components.

ENERGY TECHNOLOGY..... 396

Civil service personnel will be involved in ongoing energy research and development projects related to meeting program milestones of 1981 and subsequent years.

Lewis provides a supporting research and technology base in terrestrial energy conversion and advanced ground propulsion under sponsorship of the Department of Energy. Presently under development are large wind turbogenerators (200 to 2,500 kilowatts) to help meet public power requirements and photovoltaic power systems where their application appears practical. Other programs at Lewis supporting stationary power generation include improved coal-fired utility gas turbine and magnetohydrodynamic system studies. Energy storage systems for stationary power applications are also under development.

Ground propulsion systems development at Lewis include advanced heat engines and electric vehicles. The major thrust of the heat engine project is to advance the technology level of the auto gas turbine and Stirling engine propulsion systems such that their application to automotive propulsion would be practical and cost effective. The electric vehicle project provides near-term technology improvements to existing electric vehicle components and systems.

Program milestones for 1981 include completion of design and initiation of hardware fabrication for advanced electric and hybrid vehicle propulsion systems; the testing of ceramic components in auto gas turbine engines for automotive application; and completion, installation and initial operation of a two and one-half megawatt wind turbine.

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 660

Center Management and Operations Support is defined as that support or services being provided to all Lewis Research Center organizations which cannot be directly identified to a benefiting program or project. The civil service personnel involved are:

Director and Staff

The Center Director, Deputy Director and immediate staff, e.g., Technology Utilization, Equal Opportunity, Public Affairs, Reliability and Quality Assurance, Shuttle Assessment Office and Chief Scientist.

Management Support

Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, legal and patent counsel, program control, contracting and procurement, personnel management, property management, financial management, environmental health, resource control and management information systems and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Centerwide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation and supplies
- Medical care of employees
- Photographic and graphic support

RESOURCE REQUIREMENTS BY FUNCTION

	<u>1979 Actual</u>	<u>1980</u>		<u>1981 Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>74,251</u>	<u>80,524</u>	<u>82,203</u>	<u>84,262</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	65,394	71,057	72,143	73,673
b. Other than full time permanent positions	995	909	1,177	1,249
c. Overtime and other compensation	<u>1,068</u>	<u>1,142</u>	<u>1,408</u>	<u>1,502</u>
Subtotal, Compensation	67,457	73,108	74,728	76,424
2. <u>Benefits</u>	<u>6,488</u>	<u>6,998</u>	<u>7,061</u>	<u>7,361</u>
Subtotal, Compensation and Benefits... ..	<u>73,945</u>	<u>80,106</u>	<u>81,789</u>	<u>83,785</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	8	58	39	46
2. Personnel training	<u>298</u>	<u>360</u>	<u>375</u>	<u>431</u>
Subtotal, Supporting Costs	<u>306</u>	<u>418</u>	<u>414</u>	<u>477</u>
Total, Personnel and Related Costs	<u>74,251</u>	<u>80,524</u>	<u>82,203</u>	<u>84,262</u>

Explanation of Fund Reauirements

	1979 <u>Actual</u>	1980		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
A. <u>Compensation and Benefits</u>	<u>73,945</u>	<u>80,106</u>	<u>81,789</u>	<u>83,785</u>
1. <u>Compensation</u> ..	<u>67,457</u>	<u>73,108</u>	<u>74,728</u>	<u>76,424</u>
a. Permanent positions	65,394	71,057	72,143	73,673

The funds shown will support 2,835 permanent positions in 1981, the same level as 1980.

Basis of Cost for Permanent Positions

In 1981, the cost of permanent positions will be \$73,673,000. The increase of \$1,530,000 from the 1980 level results from the following:

Cost of permanent positions in 1980.....	72,143
Cost increases in 1981.....	+3,856
Within grade and career advances:	
Full year effect of 1980 actions.	+747
Partial year effect of 1981 actions.	+778
Full year effect of 1980 pay increases.	+1,063
Change in reimbursements..	+1,268
Cost decreases in 1981.....	-2,326
Turnover savings and abolished positions:	
Full year effect of 1980.....	-940
Partial year effect of 1981 actions.....	-1,076
One less paid day in 1981.....	-310
Cost of permanent positions in 1981.....	<u>73,673</u>

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full time permanent positions				
1. cost	995	909	1,177	1,249
2. Workyears	121	98	127	132
• The 1981 plan includes 132 workyears which will support the following programs:				

Distribution of Other than Full Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training	48
Summer employment	14
Opportunity programs.....	35
Other temporary employment	<u>35</u>
Total	<u>132</u>

The increase from the budget estimate to the current estimate in 1980 reflects the continuation of the part-time employment program, a new machinist apprentice program and the White House Research Apprenticeships program. The increase in the 1981 program is due to the scheduled build-up of the White House Research Apprenticeships program.

c. Overtime and other compensation.....	1,068	1,142	1,408	1,502
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The increase in overtime and night differential in 1980 and 1981 is related primarily to the full year cost of the October 1979 pay increase and an increase of direct cost due to a decrease in reimbursable compensation. Total overtime hours remain relatively constant.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Benefits</u>	<u>6,488</u>	<u>6,998</u>	<u>7,061</u>	<u>7,361</u>

Following are the amounts of contribution by category:

Civil Service Retirement Fund..	4,495	4,974	5,000	5,198
Employee life insurance.... ..	169	251	200	218
Employee health insurance.....	1,424	1,489	1,453	1,586
Workman's compensation.....	330	248	363	313
FICA... ..	38	30	40	41
Severance pay.....,.....	27	---	---	---
Other Benefits... ..	<u>5</u>	<u>6</u>	<u>5</u>	<u>5</u>
Total.....	<u>6,488</u>	<u>6,998</u>	<u>7,061</u>	<u>7,361</u>

The increase in 1981 is due primarily to the full year's effect of the October 1979 pay increase and promotions reflected in the compensation estimates. Workmen's compensation costs are based on the Department of Labor billings for 1980 and 1981.

B. <u>Supporting Costs</u>	<u>306</u>	<u>418</u>	<u>414</u>	<u>417</u>
1. Transfer of personnel.....	8	58	39	46

The increase in transfer of personnel in 1980 and 1981 is due to increased recruiting to meet the requirements of maintaining a constant complement.

2. Personnel training.....	298	360	375	431
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About 38% of the training cost is for technically oriented training. Another 33% is provided specifically for the scientific and engineering staff. The remaining 29% supports other programs, including administrative and clerical. The 1980 and 1981 levels include funds for announced increases in tuition, and for the Civil Service Reform Act implementation training.

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1981 <u>Budget Estimate</u>
II. <u>TRAVEL</u>	<u>1,002</u>	<u>1,208</u>	<u>1,169</u>	<u>1,244</u>
<u>Summary of Fund Requirements</u>				
A. Program Travel.	778	1,004	972	1,034
B. Scientific and Technical Development Travel.....	131	130	126	134
C. Management and Operations Travel....	<u>93</u>	<u>74</u>	<u>71</u>	<u>76</u>
Total, Travel.	<u>1,002</u>	<u>1,208</u>	<u>1,169</u>	<u>1,244</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>778</u>	<u>1,004</u>	<u>972</u>	<u>1,034</u>
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Program travel is directly related to the accomplishment of the Center's mission and accounts for approximately 83% of the travel costs. It provides funds necessary to manage major contractual programs in aeronautical research and technology, space propulsion, materials research and development and energy technology. Program travel is also essential to the management and procurement of launch vehicles. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The 1981 estimate provides for essentially the same level of travel activities as in 1980.

B. <u>Scientific and Technical Development Travel</u>	<u>131</u>	<u>130</u>	<u>126</u>	<u>134</u>
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Scientific and technical development travel permits employees to participate in meetings and seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside Lewis, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The 1981 estimate provides for essentially the same level of travel activities as in 1980.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands	of Dollars)	
C. <u>Management and Operations Travel</u>	<u>93</u>	<u>74</u>	<u>71</u>	<u>76</u>

Management and operations travel is required for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, procurement, travel of the Center's top management to NASA Headquarters and other NASA Centers, and local transportation. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction in travel to implement Section 112 of Public Law 96-86. The 1981 estimate provides for essentially the same level of travel activities as in 1980.

111. <u>FACILITIES SERVICES</u>	<u>9,565</u>	<u>10,894</u>	<u>11,312</u>	<u>12,307</u>
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Lewis Research Center (LeRC) occupies 366 acres of grounds with a complex of 170 buildings and structures, encompassing 2,208,301 square feet. **This** physical plant houses an average daily on-Center population of 3,200. Many of the test facilities are utilized on more than one shift and during off-peak hours.

The estimates also include certain resources associated with plant needs at the component installation, the Plum Brook Operations Division.

Summary of Fund Requirements

A. Maintenance and Related Services

1. Facilities.....	1,296	930	1,266	1,365
2. Equipment.....	<u>79</u>	<u>76</u>	<u>84</u>	<u>84</u>
Subtotal.....	<u>1,375</u>	<u>1,006</u>	<u>1,350</u>	<u>1,449</u>

B. <u>Custodial Services</u>	<u>1,739</u>	<u>2,075</u>	<u>2,250</u>	<u>2,353</u>
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C. <u>Utility Services</u>	<u>6,451</u>	<u>7,813</u>	<u>7,712</u>	<u>8,505</u>
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Total, Facilities Services.....	<u>9,565</u>	<u>10,894</u>	<u>11,312</u>	<u>12,307</u>
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Explanation of Fund Requirements

	1979 <u>Actual</u>	1980		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
A. <u>Maintenance and Related Services</u>	<u>1,375</u>	<u>1,006</u>	<u>1,350</u>	<u>1,449</u>
1. Facilities.... ..	1,296	930	1,266	1,365

This activity provides for the operation and maintenance of facilities at the main Installation at Cleveland and Plum Brook Station, involving 25 support contractor workyears. At Cleveland, facilities maintenance requires 18 workyears of support contractor effort: one for engineering design, six for grounds maintenance, and eleven for maintenance of heating, ventilating, and air-conditioning (HVAC) equipment. Maintenance of buildings and grounds at Plum Brook Station requires seven workyears of support contractor effort.

The increase in the 1980 current estimate over the 1980 budget estimate, and the increase in the 1981 budget estimate over the 1980 current estimate is due to an increase of 11 support contractor workyears at Cleveland for HVAC maintenance.

2. Equipment	79	76	84	84
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Funding in this category is required for periodic replacement and updating of facilities maintenance and repair shop equipment. The increase in the 1980 current estimate over the 1980 budget estimate *is* due to unexpected equipment failures.

B. <u>Custodial Services</u>	<u>1,739</u>	<u>2,075</u>	<u>2,250</u>	<u>2,353</u>
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This activity involves 122 workyears of support contractor effort, 106 at Cleveland and 16 at Plum Brook Station, to provide for security, janitorial, and fire protection services. The actual costs at Cleveland for 1979 were lower than anticipated due to problems encountered while negotiating a contract for window and floor cleaning; consequently, the cleaning services were not fully utilized. Estimates for 1980 and 1981 reflect full-year costs for services at both Cleveland and Plum Brook Station.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Security (57 workyears).				1,156
2. Janitorial (65 workyears).....				1,038
3. Other services.....				159

Other services include rubbish disposal, fly ash removal, and industrial cleaning of walls, lights and windows on an as needed basis.

C. Utilities Services.. 6,451 7,813 7,712 8,505

The 1981 estimate covers the projected consumption at Lewis and the Plum Brook Test Station. Electrical power is provided by the local utility company with locally procured fuel oil being used as a central plant fuel at both sites. Natural gas is the primary heating fuel used at Lewis with oil as a back-up fuel, depending on the market situation. Fifteen workyears of contractor effort provide for the operation of the central heating plant. The decrease in the 1980 current estimate from the 1980 budget estimate is the result of a slight downward revision in the estimate of utility rates. The increase in 1981 is due to utility rate increases and the addition of a new purchased services contract for operation of the Center's electrical power substation, which will cost \$175,000. The distribution of the utilities budget is as follows:

1. Electricity (161,448/mWh).	6,298
2. Natural gas (574,000 K cu. ft.).....	1,611
3. Fuel oil (36,000 gals.).	41
4. Water and sewage.....	190
5. Operation of electrical power substation.....	175
6. Operation of central heating plant.....	190

IV. TECHNICAL SERVICES..... 681 429 885 1,043

Summary of Fund Requirements

A. Automatic Data Processing

1. Equipment.....	15	13	20	22
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	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 Budget <u>Estimate</u>
2. Operations.....	<u>110</u>	<u>213</u>	<u>143</u>	<u>192</u>
Sub	<u>125</u>	<u>226</u>	<u>163</u>	<u>214</u>
B. <u>Scientific and Technical Information</u>				
1. Library	<u>---</u>	43	<u>---</u>	<u>---</u>
2. Education and Information.....	<u>556</u>	<u>160</u>	722	<u>829</u>
Subtotal.....	<u>556</u>	<u>203</u>	<u>722</u>	<u>829</u>
Total, Technical Services.....	<u>681</u>	<u>429</u>	<u>885</u>	<u>1043</u>

Explanation of Fund Requirements

A. Automatic Data Processing	<u>125</u>	<u>226</u>	<u>163</u>	<u>214</u>
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The funding provides for administrative data processing including equipment maintenance, programming and operation.

1. Equipment.....	15	13	20	22
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Funding in this category is required for the periodic replacement and updating of administrative ADP equipment. The increase in the 1980 current estimate over the 1980 budget estimate is due to the addition of acquisitions deferred from 1979. The 1980 level of activity is continued in 1981.

2. Operations.....	110	213	143	192
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The 1981 increase provides for a cost of living increase in the support contractor agreement and an increase in work load due to an expanding computer function. The decrease in the 1980 current estimate from the 1980 budget estimate is due to postponing full-scale expansion activities until 1981. Key punch services formerly provided by support contract are now acquired as purchased services.

	<u>1979</u> <u>Actual</u>	<u>1980</u> Budget <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	<u>1981</u> Budget <u>Estimate</u>
B. <u>Scientific and Technical Information</u>	<u>556</u>	<u>203</u>	<u>722</u>	<u>829</u>

Included in this activity are the purchase of pamphlets, supplies, and materials required for the operation of the Lewis Research Center educational programs, public information services, and the operation of the Visitor Information Center ■

1. Library.....	---	43	---	---
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Planned acquisitions which appeared in the 1980 budget estimate have been cancelled.

2. Education and Information.....	556	160	722	829
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Funding for operation of the Visitor Information Center, conduct of tours and special events, construction and transport of special exhibits, and related activities are included in this category. The increase in the 1980 current estimate over the 1980 budget estimate is due to the transfer from Headquarters, a contract of 12 support contractor workyears and an increase in supplies and materials.

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>1,958</u>	<u>2,745</u>	<u>2,256</u>	<u>2,504</u>
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Summary of Fund Requirements

A. Administrative Communications.....	626	751	656	731
B. Printing and Reproduction.....	4	5	4	4
C. Transportation.....	477	601	557	629
D. Installation Common Services.....	<u>851</u>	<u>1,388</u>	<u>1,039</u>	<u>1,140</u>
Total, Management and Operations.....	<u>1,958</u>	<u>2,745</u>	<u>2,256</u>	<u>2,504</u>

Explanation of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A. Administrative Communications	<u>626</u>	<u>751</u>	<u>656</u>	<u>731</u>

This estimate provides for leased lines and equipment for local and long distance telephone service, Federal Telecommunications Service (FTS), trunklines for Federal communications, and nontelephone communications including telex, advanced records system, datafax and teleconference equipment. The decrease in the 1980 current estimate from the 1980 budget estimate is the result of an effort to constrain the growth of costs in this function. The 1981 estimate assumes the same level of service as in 1980, provided at higher rates.

1. Local telephone service..... 339

This activity includes the leased lines and equipment necessary to serve the Center. This service is comprised of approximately 1,785 instruments, 800 stations and 40 incoming and outgoing lines.

2. Long distance telephone service..... 357

Commercial long distance costs, FTS costs, and overseas calls are included in this category.

3. Nontelephone communications..... 35

This estimate includes funds for one telex instrument, one GSA teletype, advanced record systems unit, one "rapidfax," one "datafax," four teleconference units, oceanic cable service, and postage.

..... B. ~~Printing and Reproduction~~..... 4 5 4 4

This activity includes general administrative printing services.

C. Transportation..... 477 601 557 629

This function includes services for moving and hauling, packing and crating, motor vehicles special maintenance, procurement, aircraft operation and maintenance. One support contractor workyear is utilized

at Plum Brook Station for heavy equipment maintenance. The decrease in the 1980 current estimate from the 1980 budget estimate is the result of efforts to constrain costs in this function. The 1981 estimate assumes the same level of services as 1980.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
D. <u>Installation Common Services.....</u>	<u>851</u>	<u>1,388</u>	<u>1,039</u>	<u>1,140</u>

This funding provides for 41 workyears of support contractor effort to support Center management and staff activities, medical services, and various Installation support services. The decrease in the 1980 current estimate from the 1980 budget estimate is due to a reduction in purchases of supplies and materials.

1. Center management and staff..... 81

This funding provides for a support service contract for Center management and administrative records keeping.

2. Medical services..... 315

At Cleveland this category includes the cost of our staff examinations clinic support service contract and medical supplies and special x-ray and medical examinations for our in-house occupational medicine program. These services are provided by six workyears of support contractor effort. At Plum Brook Station two workyears of support contractor health physicist effort is required to monitor the nuclear reactor.

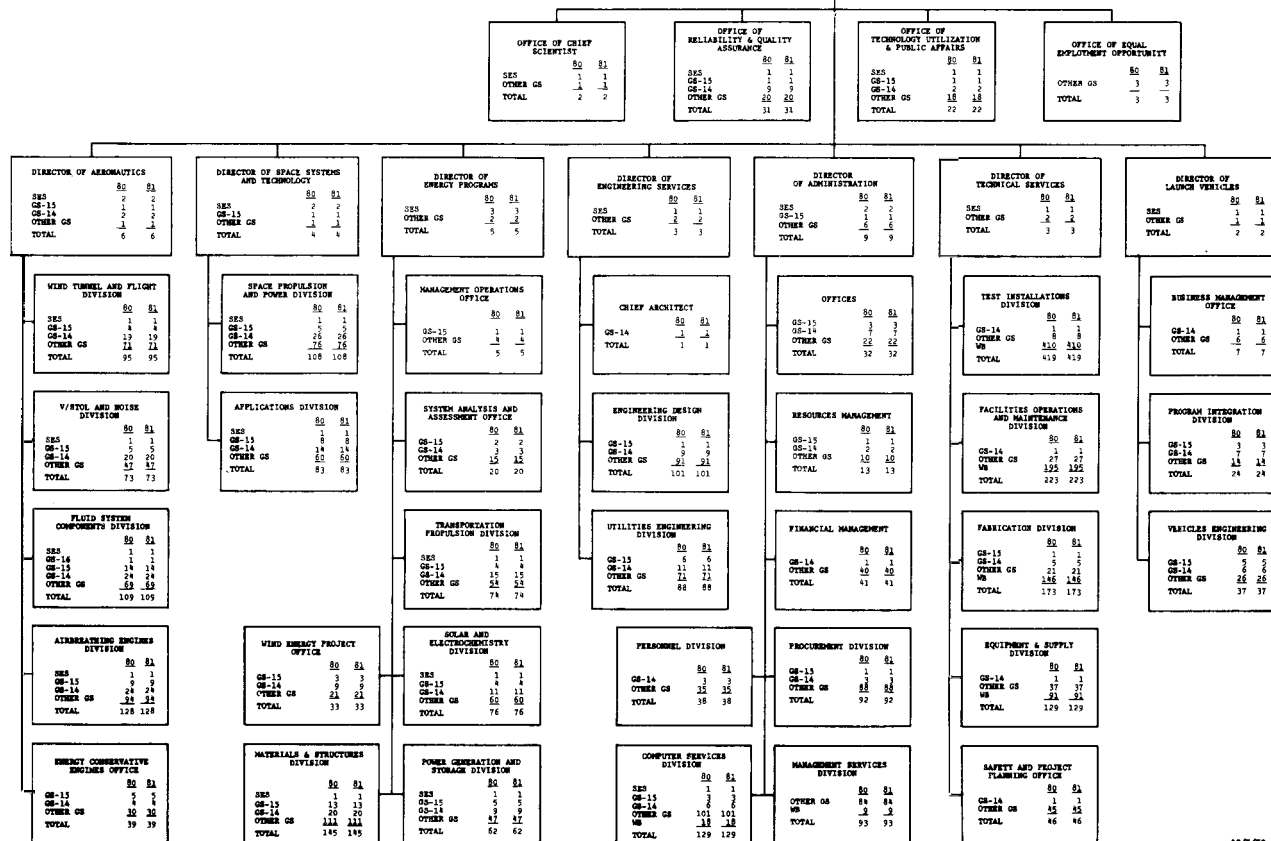
3. Installation support services..... 744

This function includes 33 workyears of support contractor effort for mail and package distribution services, and stock issue and warehouse operations. Also included are the purchase and maintenance of office machines and equipment. Twenty-eight of the workyears are utilized at Cleveland and five at Plum Brook Station.

**National Aeronautics and Space Administration
Organization and Staffing Chart
LEWIS RESEARCH CENTER
Cleveland, Ohio**

STAFFING SUMMARY			
SES	82	81	
GS-16	30	30	
GS-15	111	111	
GS-14	277	277	
OTHER GS	1587	1587	
WB	862	862	
TOTAL	2835	2835	

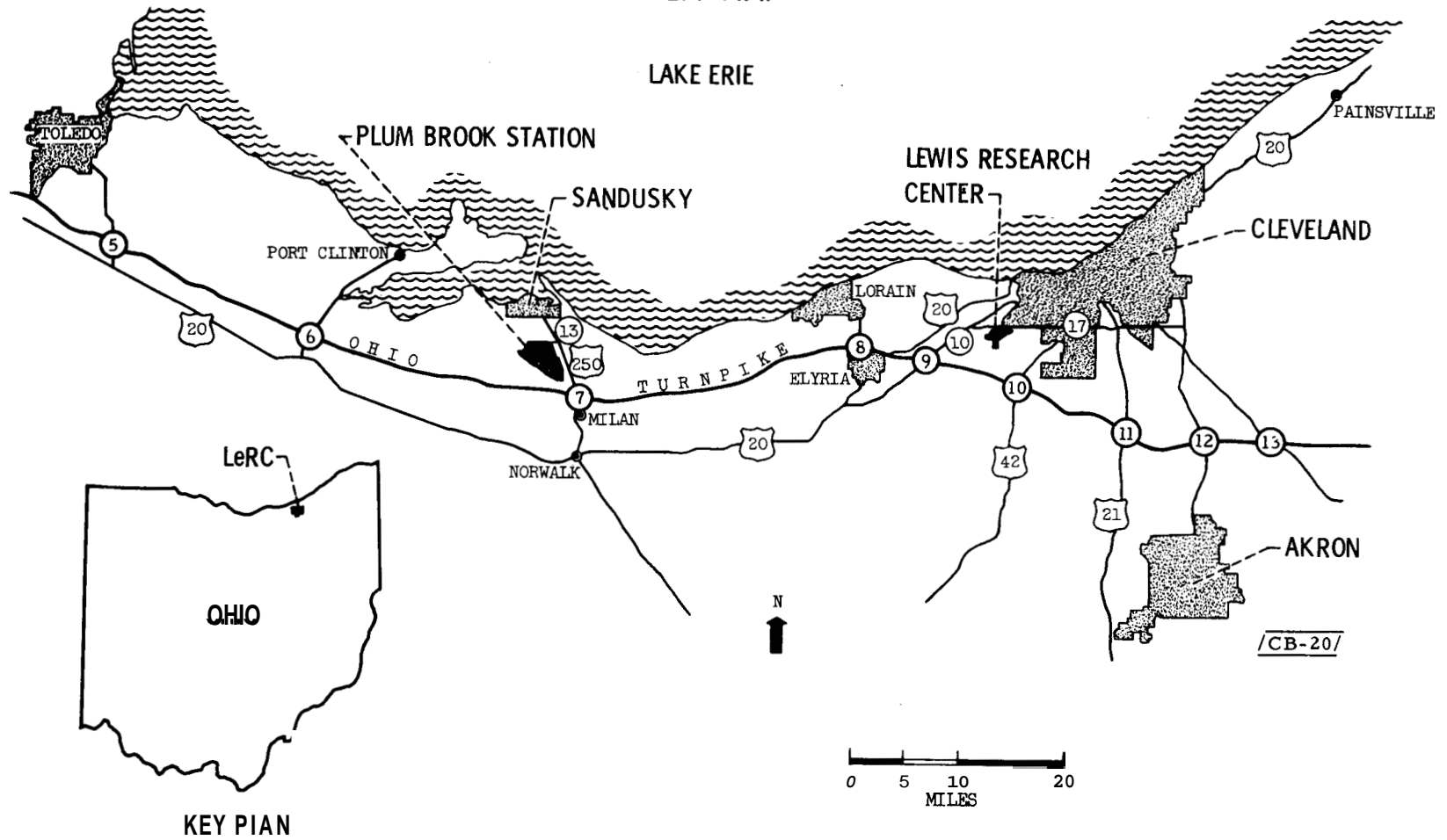
DIRECTOR'S OFFICE			
SES	82	81	
GS-16	4	4	
OTHER GS	2	2	
TOTAL	9	9	



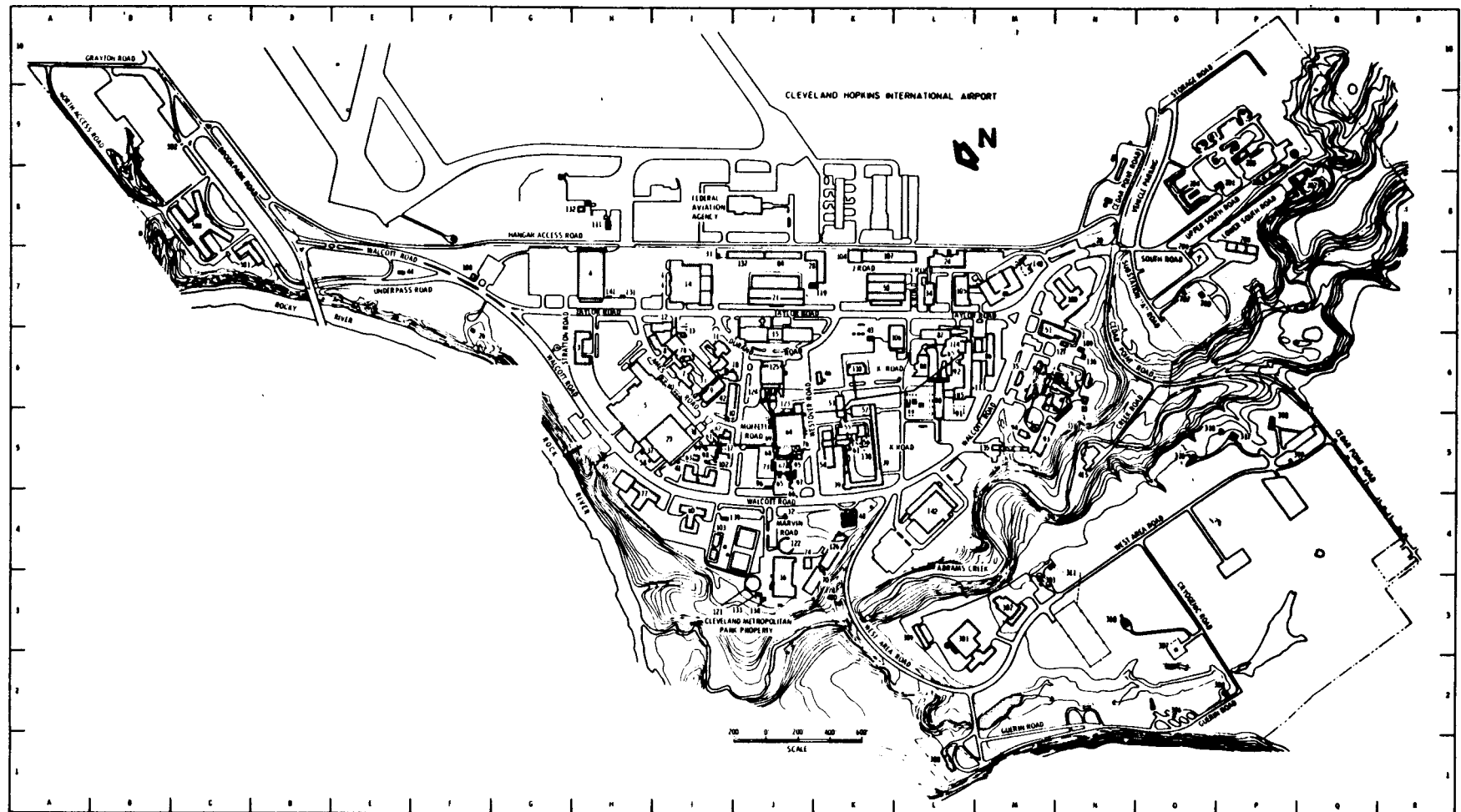
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LEWIS RESEARCH CENTER
FISCAL YEAR 1981 ESTIMATES

AREA MAP

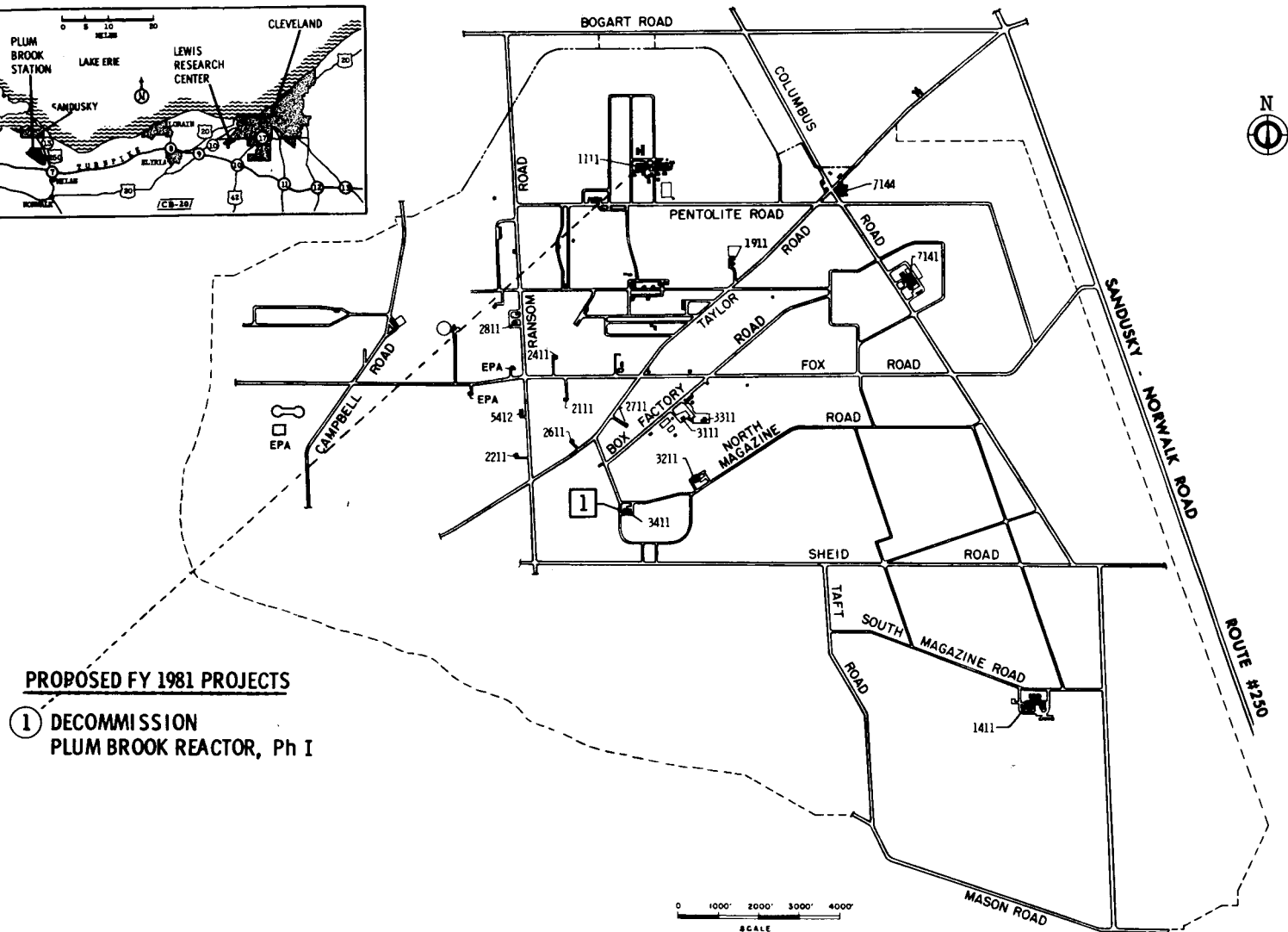
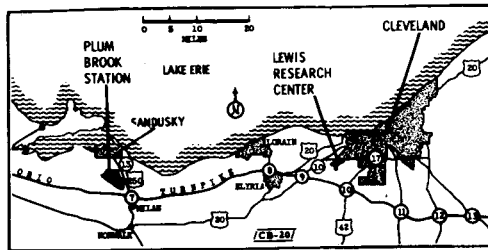


LEWIS RESEARCH CENTER
FISCAL YEAR 1981 ESTIMATES
LOCATION PLAN



LEWIS RESEARCH CENTER
PLUM BROOK STATION
FISCAL YEAR 1981 ESTIMATES

LOCATION P M N



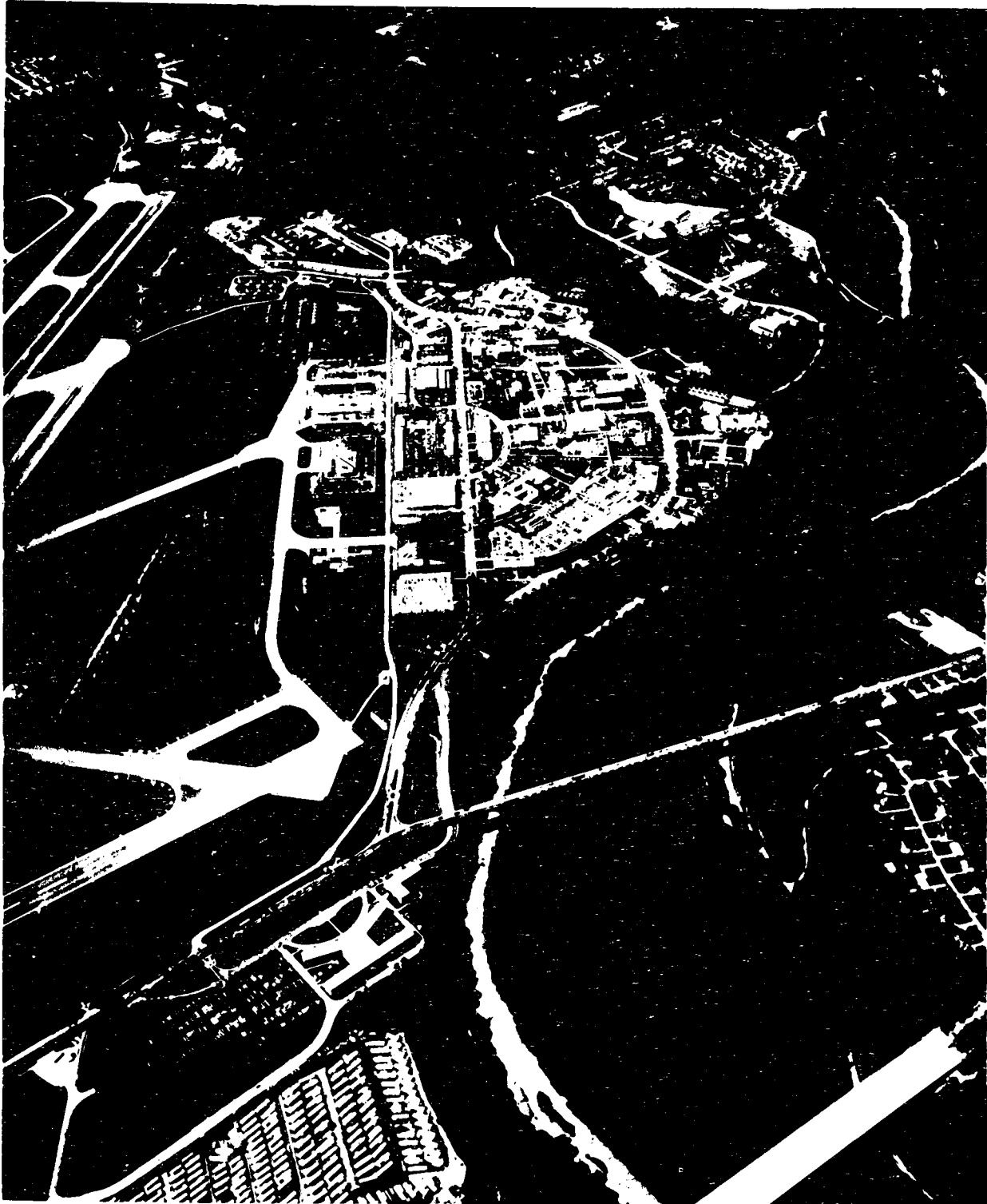
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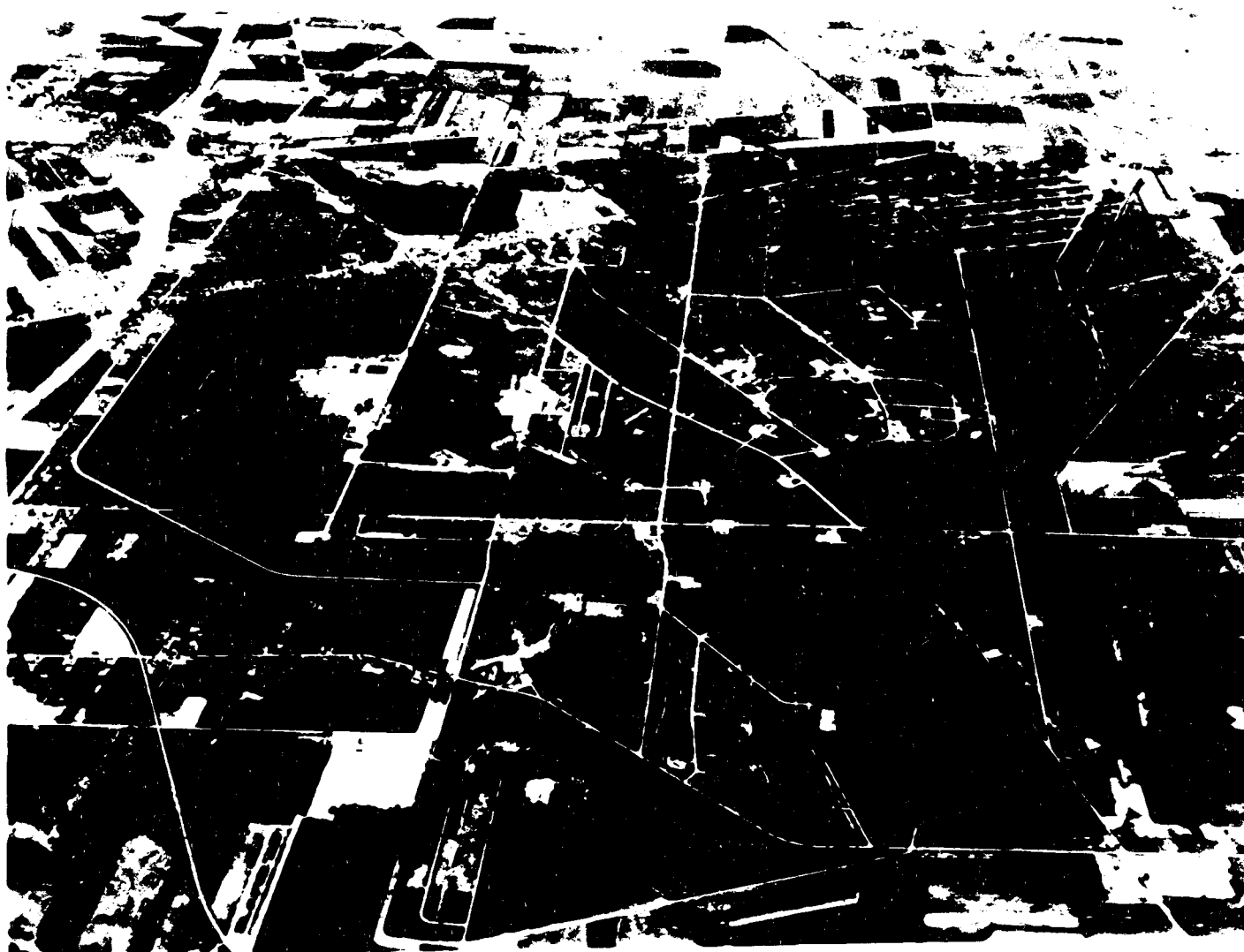
RPM 10-25

LEWIS RESEARCH CENTER
FISCAL YEAR 1981 ESTIMATES
CLEVELAND FACILITIES

RPM 10-26



LEWIS RESEARCH CENTER
FISCAL YEAR 1981 ESTIMATES
PLUM BROOK FACILITIES



NASA
HEADQUARTERS

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

NASA HEADQUARTERS

DESCRIPTION

NASA Headquarters is located at 400 Maryland Avenue, SW, Washington, DC, and occupies other buildings in the District of Columbia, Maryland and Virginia. Except for some office space leased in the District of Columbia and a storage area in Virginia, personnel occupy Government-owned buildings.

HEADQUARTERS ROLES AND MISSIONS

The mission of the National Aeronautics and Space Administration Headquarters is to plan and provide executive guidelines for the implementation of national space and aeronautics programs consistent with the objectives stated in the National Aeronautics and Space Act of 1958, as amended. These objectives are to:

1. Extend our knowledge of the Earth, its environment, the solar system, and the universe;
2. Expand practical applications of space technology;
3. Develop, operate, and improve manned and unmanned space vehicles;
4. Improve the civil and military usefulness of aeronautical vehicles, while minimizing their environmental effects and energy consumption;
5. Disseminate pertinent findings to potential users; and
6. Promote international cooperation in peaceful activities in space.

The following offices at Headquarters assist management in carrying out the technical aspects of the mission:

Office of Space Transportation Systems: Responsible for the research, development and operations of space flight programs including the Space Shuttle, the essential element of the Space Transportation System that will be used to conduct the space operations of the 1980's. The Space Transportation System consists of the Shuttle, a reusable manned vehicle; and the Spacelab, an experiments payload carrier being developed by the European Space Agency. Transportation Systems office also has program responsibility for expendable launch vehicles. (A new Headquarters program office has been established to be responsible for operations of the Space Transpor-

tation System, and is currently under study in regard to the organizational structure'and staffing).

Office of Space Science: Responsible for scientific research and development effort utilizing a variety of flight system and ground-based observations to increase man's knowledge of the universe. The Earth, Sun, Moon, the planets, interplanetary space, other stars and galaxies, and the interaction among those bodies and systems are all objects of these investigations. The Life Sciences program is also under the direction of the Office of Space Science.

Office of Space and Terrestrial Applications: Responsible for Conducting research and development activities leading to demonstration and transfer of space-related technology and capabilities which can be effectively applied and used for practical benefits on Earth. These research and development activities involve the following program areas: resource observation, environmental observation, space communications, material processing in space, technology transfer, and technology utilization.

Office of Aeronautics and Space Technology: Responsible for the aeronautical space and energy research and technology programs. The aeronautics program develops technology culminating in safer, more efficient, economical and environmentally acceptable air transportation systems which are responsive to national needs. The space research and technology program provides a technology base which anticipates the technical needs and provides technology options for future space activities. The energy program provides an interface with and support to the Department of Energy in the execution of interagency related activities conducted by NASA. The Office of Aeronautics and Space Technology is also responsible for coordinating the total NASA program of supporting research and technology related to specific programs and projects to insure a comprehensive properly balanced agency research and technology program.

Office of Space Tracking and Data Systems: Responsible for the development, implementation, and operation of tracking, data acquisition, command, communications, and data processing facilities, systems and services required for support of all NASA flight missions. This office also provides centralized planning and systems management for the administrative communications of NASA installations.

Research and Program Management (R&PM) funding is used to support the staffing and operation of NASA Headquarters in Washington, DC. The overall capability of the agency to operate effectively is dependent upon sufficient R&PM funds to hire and support a Headquarters workforce to furnish direction and coordinate the accomplishment of the Agency mission. This portion of the budget is prepared to accomplish the following objectives:

- o To provide a balanced Agency Headquarters workforce capable of planning, formulating, advocating and providing executive direction to national programs to implement the objectives stated in the National Aeronautics and Space Act of 1958, as amended.

- o To provide a balanced Headquarters supporting workforce capable of providing necessary administrative, operational and logistical support to those Headquarters elements concerned with carrying out the mission of the National Aeronautics and Space Administration.
- o To provide adequate facilities to house the workforce in Washington, DC.
- o To provide for technical, administrative and logistical support necessary to facilitate accomplishment of NASA goals and objectives as administered by the Headquarters.

The Headquarters workforce consists of a professional and clerical staff organized into the program offices indicated above and appropriate supporting staff offices. Funding for pay, travel and necessary support services are included in this portion of the budget submission. Each office is assigned a function consistent with NASA Headquarters mission. The number of personnel authorized to an office is determined by Management based on the approved personnel ceiling for the Agency and the functions to be performed. The composition of the staff of an office is determined by the head of the office based on the office ceiling and the function to be performed. All personnel are appointed and paid consistent with classification standards established by Office of Personnel Management. Overall Agency direction is provided by the Administrator, and his personal office staff: He is assisted by heads of special and technical staff offices which perform functions necessary to the effective operation of the Agency and the Headquarters. Such offices are concerned with administration and management or support of the Headquarters. Included are such offices as the Chief Scientist, Chief Engineer, Comptroller, General Counsel, External Relations, Management Operations, Aerospace Safety Advisory Panel, Equal Opportunity, Procurement and the Inspector General. The Headquarters currently has eleven (11) installations throughout the U.S. which Perform agency operational missions under direction of the Headquarters staff.

The Headquarters supporting personnel are organized to perform agency and Headquarters functions, although some elements perform only Headquarters support. For example, the Office of Headquarters Administration provides for support to the personnel and physical plant in Washington, while the Office of Personnel Programs provides both Headquarters and Agency direction and support with respect to personnel requirements.

Facilities consist of GSA leased space at FB-6, FB-10B and Reporters Building in Washington, DC, and a storage area in Virginia.

Technical support required by Headquarters is performed primarily by support service contractors. Currently, contractors support Headquarters automatic data processing and the scientific and technical information program. Administrative and logistical support is provided by the in-house workforce assisted by miscellaneous contract services. Such support includes communications, printing, supplies, materials, equipment, transportation, occupational medicine and health, and other administrative support services.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands	of - Dollars)	
I. Personnel and Related Costs	54.268	55.893	60.267	64.037
II. Travel	2.769	2.697	2.836	3.236
III. Facilities Services	5.112	5.662	5.693	5.904
IV. Technical Services	15.550	15.989	14.557	16.378
V. Management and Operations	<u>6.774</u>	<u>7.256</u>	<u>7.335</u>	<u>8.074</u>
Tptal. fund requirements	<u>84.473</u>	<u>87.497</u>	<u>90.688</u>	<u>97.629</u>

Distribution of Permanent Positions by Program

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>196</u>	196	203	<u>230</u>
Space shuttle	77	70	89	89
Space flight operations	105	112	103	130
Expendable launch vehicles	14	14	11	11
<u>Space Science</u>	104	101	114	114
Physics and astronomy	51	48	60	60
Planetary exploration	30	30	31	31
Life sciences	23	23	23	23

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
Space and Terrestrial Applications	111	114	114	114
Space applications	93	95	95	95
Technology utilization	18	19	19	19
Aeronautics and Space Technology	160	159	142	142
Aeronautical research and technology	82	81	74	74
Space research and technology	58	58	47	47
Energy technology	20	20	21	21
<u>Space Tracking and Data Systems</u>	46	46	50	52
Tracking and data acquisition	46	46	50	52
Subtotal. direct positions	617	616	623	652
<u>Management and Operations Support Positions</u>	888	877	897	933
Total. permanent positions	<u>1.505</u>	<u>1.493</u>	<u>1.520</u>	<u>1.585</u>

RESOURCE REQUIREMENTS BY FUNCTION

	1979 <u>Actual</u>	<u>. 1980</u>		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>54.268</u>	<u>55.893</u>	<u>60.267</u>	<u>64.037</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	46.773	48.236	50.080	53.497
b. Other than full time permanent positions.....	1.295	1.203	1,456	1,446
c. Reimbursable detailees.....	405	314	537	537
d. Overtime and other compensation.....	<u>399</u>	<u>488</u>	<u>2.184</u>	<u>2.184</u>
Subtotal. Compensation.....	48.872	50.241	54.257	57.664
2. <u>Benefits</u>	<u>4.332</u>	<u>4.546</u>	<u>4.681</u>	<u>4.989</u>
Subtotal. Compensation and Benefits.....	<u>53.204</u>	<u>54.787</u>	<u>58.938</u>	<u>62.653</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	402	234	400	400
2. Office of Personnel Management services.....	101	140	140	146
3. Personnel training.....	<u>561</u>	<u>732</u>	<u>789</u>	<u>838</u>
Subtotal. Supporting Costs.....	<u>1.064</u>	<u>1.106</u>	<u>1,329</u>	<u>1,384</u>
Total. Personnel and Related Costs.....	<u>54.268</u>	<u>55.893</u>	<u>60.267</u>	<u>64.037</u>

Explanation of Fund Requirements

	1979 <u>Actual</u>	1980		1981 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
A. <u>Compensation and Benefits</u>	<u>53,204</u>	<u>54,787</u>	<u>58,938</u>	<u>62,653</u>
1. <u>Compensation</u>	<u>48,872</u>	<u>50,241</u>	<u>54,257</u>	<u>57,664</u>
a. Permanent positions	46,773	48,236	50,080	53,497

The cost for permanent positions is the largest part of personnel and related costs. The funds shown above will support 1,520 permanent positions in 1980 and 1,585 in 1981. The 65 additional positions in 1981 are required for the Office of the NASA Inspector General (25) and to support the Space Shuttle activities (40).

Basis of Cost for Permanent Positions

The estimate for permanent compensation (starting from prior year cost) is based upon the position structure at the start of the year, as modified by the addition of new positions and abolishment of existing positions, within grade advances, career advances, and the October 1979 pay increases. After these modifications, the year-end position structure is established and the cost effect for the year is calculated based on the estimated period that these modifications are in effect, as follows:

Cost of permanent positions in 1980.....	50,088
Cost increases in 1981.....	3,904
Within grade and career advances:	
Full year effect of 1980 actions.....	+811
Partial year effect of 1981 actions.....	+727
Full year effect of 1980 pay increases.....	+102
65 additional positions.....	+2,264
Cost decreases in 1981.....	-487
Turnover savings and abolished positions:	
Full year effect of 1980 actions.....	-282
One less paid day in 1981.....	-205
Cost of permanent positions in 1981.....	<u>53,497</u>

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
		(Thousands of Dollars)		
b. Other than full time permanent positions				
1. Cost.....	1,295	1,203	1,456	1,446
2. Workyears.....	141	108	139	141

The increase from the 1980 budget estimate to the 1980 current estimate is due to the effect of the 1980 pay increase, an increase in the part-time program, and the new White House Research Apprenticeship program. Within this program level estimate, the program is slightly skewed in 1980 to accommodate, within reasonable limits, a significant number of re-employed annuitants following the 1979 early-out retirement authority. The cost decrease in 1981 reflects a change in skill mix across the temporary program. The slight increase in the 1981 workyear estimate reflects the scheduled build-up of the White House Research Apprenticeship program. The 1981 plan includes 141 workyears, which will be used to support the following programs at the levels indicated below.

Distribution of Other Than Full Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>			
Cooperative training				
Total.....			<u>141</u>	
c. Reimbursable detailees.....	405	314	537	537

The services of a small group of military officer and civilian detailees from other government agencies are utilized by NASA Headquarters where such assignments are of mutual benefit. The number of personnel detailed varies from seven to sixteen, all of whom are assigned to Headquarters program offices with the exception of three that are assigned to the Office of Facilities. The current estimates for 1980 and 1981 will cover the cost of thirteen manyears, an increase of four from the 1980 budget estimate. The 1980 current estimate and the 1981 estimate reflect the cost of the October 1979 pay increase.

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
d. Overtime and other compensation	399	488	2,184	2,184

The increase in **the** 1980 current estimate over the 1980 budget estimate reflects the 1980 pay increases. Included in the 1980 current estimate and the 1981 budget estimate is the Agency pool of \$1,750,000 for the Senior Executive Service (SES) Rank and Performance awards.

2. <u>Benefits</u>	<u>4,332</u>	<u>4,546</u>	<u>4,681</u>	<u>4,989</u>
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Following are the amounts of contributions by category:

Civil Service Retirement Fund.	3,294	3,365	3,518	3,755
Employees life insurance..	141	217	156	166
Employees health insurance.	731	733	792	830
Workmen's compensation	106	128	143	150
FICA	58	68	72	88
Severance pay.... ..	<u>2</u>	<u>35</u>	<u>--</u>	<u>--</u>
Total.	<u>4,332</u>	<u>4,546</u>	<u>4,681</u>	<u>4,989</u>

In addition to compensation, NASA makes an employer's contribution to personnel benefits as authorized and required by law. The increase in the 1980 current estimate from the 1980 budget estimate reflects the cost of the October 1979 pay increases. The 1981 estimate includes benefit costs for the 65 additional permanent positions. Workmen's compensation costs are based on the Department of Labor bills for 1980 and 1981.

B. <u>Supporting Costs</u>	<u>1,064</u>	<u>1,106</u>	<u>1,329</u>	<u>1,384</u>
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Supporting personnel costs provide for the expenses of moving employees to their initial duty station or reassignment; for security investigations and other recruitment costs; and for maintaining and expanding the skills of our employees. These costs are summarized as follows:

1. Transfer of personnel	402	234	400	400
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Legislation enacted in 1966 provided that the Government would pay for certain relocation costs which are budgeted in this category, such as the expenses of selling and buying a home and the cost of family relocations. The estimated costs for 1980 and 1981 are based on the historical average cost of relocations estimated at Headquarters and in anticipation of bringing on board additional personnel to work in the Space Transportation Systems area.

	1979	1980		1981
	<u>Actual</u>	Budget <u>Estimate.</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		

2. Office of Personnel Management services.....	101	140	140	146
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Headquarters reimburses the Office of Personnel Management (OPM) and others for investigation of new hires for the entire agency. The cost of investigations is a function of two variables, the number of investigations to be conducted, and the unit charge made by the Office of Personnel Management or other agencies. There is also a payment to OPM for Federal wage system surveys.'

3. Personnel training	561	732	789	838
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The maintenance and expansion of the skills is essential in carrying out the agency's many complex technical programs. Such training is provided within the framework of the Government Employees Training Act of 1958. Part of the training consists of courses offered by other Government agencies, usually for a fee. The remainder of the training is provided through nongovernmental sources. The costs are for tuition, fees and related costs for training at colleges, universities, technical institutions, and for the cost of seminars and workshops in which groups of Headquarters and Field Center employees receive training in subjects of agencywide interest. Such training is used to maintain and expand employee skills. The increase in the 1980 current estimate and 1981 levels of training over 1979 experience is due to new training requirements for the Civil Service Reform Act implementation.

11. <u>TRAVEL</u>	<u>2,769</u>	<u>2,697</u>	<u>2,836</u>	<u>3,236</u>
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Summary of Fund Requirements

A. Program Travel.....	1,210	1,201	1,448	1,713
B. Scientific and Technical Development Travel.....	413	305	305	323
C. Management and Operations Travel.....	<u>1,146</u>	<u>1,191</u>	<u>1,083</u>	<u>1,200</u>
Total, Travel.....	<u>2,769</u>	<u>2,697</u>	<u>2,836</u>	<u>3,236</u>

Explanation of Fund Requirements

	1979 <u>Actual</u>	1980 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1980 <u>Current</u> <u>Estimate</u>	1981 <u>Budget</u> <u>Estimate</u>
A. <u>Program Travel</u>	<u>1,210</u>	<u>1,201</u>	<u>1,448</u>	<u>1,713</u>
<p>Program travel funds are used in support of NASA's research and development programs, such as the Space Shuttle, Space Flight Operations, Aeronautics and Space Technology, Space and Terrestrial Applications, Space Science, and other direct Research and Development (R&D) projects. This category represents approximately 53 percent of the Headquarters travel requirements for 1981. The increases in the current 1980 and 1981 estimates are a result of increased costs and travel associated primarily with Space Shuttle development and preparation for Space Transportation Systems Operations,</p>				
B. <u>Scientific and Technical Development Travel</u>	413	<u>305</u>	<u>305</u>	323
<p>Scientific and technical development travel permits employees to participate in meetings and seminars with other representatives of the aerospace community. This participation allows personnel to benefit from exposure to technological advances in the field which arise outside NASA, as well as to present both accomplishments and problems to their associates. Many of these meetings are working panels convened to solve certain problems for the benefit of the Government.</p>				
C. <u>Management and Operations Travel</u>	<u>1,146</u>	<u>1,191</u>	<u>1,083</u>	<u>1,200</u>
<p>Management and operations travel is for the direction and coordination of general management matters, travel by senior officials to review Center requirements and operations. Travel by functional managers in such areas as personnel, financial management, and procurement to assure agency policies and procedures are being implemented throughout the agency; local transportation; and Congressional travel. The decrease from the 1980 budget estimate to the 1980 current estimate reflects a reduction to implement Section 112 of Public Law 96-86. The increase in 1981 results from increased management travel associated with the Shuttle Program.</p>				
III. <u>FACILITIES SERVICES</u>	<u>5,112</u>	<u>5,662</u>	<u>5,693</u>	<u>5,904</u>

NASA Headquarters involves a complex of buildings in the District of Columbia, Maryland and Virginia. These are both Government-owned and leased buildings for which NASA must provide reimbursement to GSA in accordance with P.L. 92-313.

This complex encompasses some 556,790 gross square feet of building space including six buildings. This complex of primary office space supports an average daily Headquarters population of 2,000 personnel.

Summary of Fund Requirements

	1979	<u>1980</u>		1981
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A <u>Rental of Real Property</u>	4,476	4,866	4,882	5,011
B <u>Maintenance and Related Services</u>	463	629	629	698
1. <u>Facilities</u>	463	629	629	698
C <u>Custodial Services</u>	173	167	182	195
Total, Facilities Services	5,112	5,662	5,693	5,904

Explanation of Fund Requirements

A Rental of Real ~~Property~~..... 4,476 4,866 4,882 5,011

Public Law 92-313 requires that agencies be charged for space and related services provided by the General Services Administration (GSA) at approximate commercial equivalent rates. The amounts provided here covers the cost of office and warehouse space utilized by NASA Headquarters personnel. The 1980 current and the 1981 budget estimate reflects increased rental rates as projected by GSA.

B Maintenance and Related ~~Services~~..... 463 629 629 698

 1. Facilities..... 463 629 629 698

This estimate includes maintenance, repair and alterations of buildings such as partition changes, telephone changes and general buildings maintenance. The 1981 estimate reflects increased requirements associated with anticipated changes in the utilization of office space in the building currently shared by NASA and the new Department of Education.

C Custodial Services..... 173 167 182 195

 1. Security guard service..... 190

These funds cover security guard service in the various Headquarters buildings. The 1980 current estimate and the 1981 budget estimate reflect projected rate increases.

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. Security alarm systems.....				5
This estimate includes reimbursement to GSA for the installation and maintenance of the security alarm systems and equipment in the NASA Headquarters buildings.				
IV. <u>TECHNICAL SERVICES</u>	<u>15,550</u>	<u>15,989</u>	<u>14,557</u>	<u>16,378</u>
<u>Summary of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>				
1. Equipment.....	1,929	1,298	1,298	1,595
2. Operations.....	<u>3,486</u>	<u>3,752</u>	<u>3,720</u>	<u>4,309</u>
Subtotal.....	<u>5,415</u>	<u>5,050</u>	<u>5,018</u>	<u>5,904</u>
B. <u>Scientific and Technical Information</u>				
1. Library.....	203	184	213	223
2. Education and Information.....	<u>9,479</u>	<u>10,295</u>	<u>8,866</u>	<u>9,764</u>
Subtotal.....	<u>9,682</u>	<u>10,479</u>	<u>9,079</u>	<u>9,987</u>
C. <u>Shop Support and Services</u>	<u>453</u>	<u>460</u>	<u>460</u>	<u>487</u>
Total, Technical Services.....	<u>15,550</u>	<u>15,989</u>	<u>14,557</u>	<u>16,378</u>
<u>Explanation of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>	<u>5,415</u>	<u>5,050</u>	<u>5,018</u>	<u>5,904</u>
This estimate provides for the lease, purchase, maintenance, programming and operations services of ADP equipment and involves one hundred support contractor manyears of effort in 1981.				

	1979	1980		1981
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
1. Equipment	1,929	1,298	1,298	1,595

The funding provides for the maintenance and lease of **ADP** equipment. The increase in 1981 is due to increased costs of leasing equipment and a slight increase in maintenance costs.

2. Operations	3,486	3,752	3,720	4,309
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The decrease in the 1980 current estimate from the 1980 budget estimate is due to a reduction in the time sharing services. The increase in the 1981 estimate is due to the development of a medical information system.

B. <u>Scientific and Technical Information..</u>	<u>9,682</u>	<u>10,479</u>	<u>9,079</u>	<u>9,987</u>
1. Libraries	203	184	213	223

The technical libraries provide reference acquisition, cataloging, translating and dissemination services to all NASA employees. The increases in the 1980 current estimate and the 1981 estimate are due to increased costs.

2. Education and information	9,479	10,295	8,866	9,764
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Two major activities are contained in this subfunction. The first is educational-informational programs and the second is the NASA Headquarters scientific and technical information activity. The decrease in the 1980 current estimate from the 1980 budget estimate reflects some rephasing of support contract funding plans. The 1981 estimate reflects full funding of essentially the same level of services as in 1980 and provides for two hundred twenty-one support contract workyears of effort.

a. Education and information program.....	1,616
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The education and information programs provide for the gathering and dissemination of information about the agency's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary levels. Assistance to the mass communications media includes the gathering and exposition of newsworthy material in support of their requests, and takes such forms as press kits, news releases, television and radio information tapes and clips, and feature material. Research, development, and operational missions in aeronautics and space provide substantive knowledge and serve as an educational stimulus to students and teachers. NASA responds to expressed needs of students by developing curriculum supplements in space-related areas such as physics, biology, chemistry, and math; assistance to over

1,000 teacher workshops and professional education meetings (with over 30,000 teachers participating); and participation in science fairs. The largest single program is the Aerospace Education Science program, a touring space science education lecture demonstration unit. This program also provides for Equal Employment Opportunity exhibits and films to relate to high schools, colleges and the public, the key roles that women and minorities have in the U.S. Space Program.

	1979 <u>Actual</u>	<u>1980</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1981 <u>Budget</u> <u>Estimate</u>
b. Scientific and technical information.....				8,148
<p>The scientific and technical information activity includes the cost of the NASA Scientific and Technical Information Facility (STIF), documentation and publication services, systems development, and translation services. The largest requirement is the NASA Scientific and Technical Information Facility, with an estimated cost of \$4.1 million in 1981. The cost of all other information services is estimated at approximately \$4 million in 1981. These costs are for the documentation of worldwide aerospace journal and report literature; monographs and technical reviews; analyzing, evaluating, and testing new methods and systems in the field of scientific communications to increase the effectiveness of the technical information program; and translating foreign language technical books, reports, and journal articles required to meet the needs of NASA and its contractor scientific personnel to keep abreast of world developments in the space science and related fields.</p>				
C. <u>Shop Support and Serv</u>	<u>453</u>	<u>460</u>	<u>460</u>	<u>487</u>
<p>These funds provide for the continuation of studies on reliability, cost evaluations and NASA-wide Safety, Reliability and Quality Assurance Standards. They also provide for Graphic and Photo Processing Services. The increase in the 1981 budget over the 1980 current estimate is due to an increase in cost in supplies and materials for Graphic and Photo Processing Services.</p>				
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>6,774</u>	<u>7,256</u>	<u>7,335</u>	<u>8,074</u>

Summary of Fund Requirements

	1979	1980		1981
	<u>Actual</u>	<u>Rudget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. Administrative Communications.....	1,399	1,520	1,602	1,717
B. Printing and Reproduction.....	940	1,124	990	1,002
C. Transportation.....	368	304	471	535
D. Installation Common Services.....	<u>4,067</u>	<u>4,308</u>	<u>4,272</u>	<u>4,820</u>
Total, Management and Operations.....	<u>6,774</u>	<u>7,256</u>	<u>7,335</u>	<u>8,074</u>

Explanation of Fund Requirements

A. <u>Administrative Communications</u>	<u>1,399</u>	<u>1,520</u>	<u>1,602</u>	<u>1,717</u>
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Included in this category are the costs of leased lines, long distance tolls, telephone exchange services, and other communications. The increases from the 1980 budget estimate to the 1980 current estimate and in the 1981 budget estimate are due to rate increases for FTS, local telephone and exchange services, and long distance tolls.

1. Long distance telephone service.....	877
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Covers cost of leased lines and long distance tolls.

2. Nontelephone communications (Includes TWR) services.....	179
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3. Other communication services.....	661
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Includes cost of operation of telephone exchange services.

B. <u>Printing and Reproduction</u>	<u>940</u>	<u>1,124</u>	<u>990</u>	<u>1,002</u>
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Administrative printing includes funds for contractual printing and the related composition and binding operations. This includes services performed by other agencies, chiefly the Government Printing Office, or by commercial printing firms. All common processes of duplicating including photostating, blueprinting, micro-

microfilming, and other reproductions are included. The decrease in the 1980 current estimate from the 1980 budget estimate reflects a slight decrease in requirements for supplies and materials. The FY 1981 estimate provides for five workyears of support contractor effort.

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u> (Thousands of Dollars)	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
C. <u>Transportation</u>	<u>368</u>	<u>304</u>	47 1	<u>535</u>

Transportation services include rental of trucks, as well as the movement of supplies, materials, equipment and related items. Also included is the cost of operating and maintaining the administrative aircraft which is assigned to the Jet Propulsion Laboratory, but funded through NASA Headquarters.

The increases in the 1980 current estimate and the 1981 budget estimate are due to increased costs for fuel and parts for the operation and maintenance of the Beachcraft Queenaire administrative aircraft; and, in 1981, the replacement of an 11-year old 25-passenger bus at the Jet Propulsion Laboratory is required.

D. <u>Installation Common Services</u>	<u>4,067</u>	<u>4,308</u>	<u>4,272</u>	<u>4,820</u>
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This function includes 19 workyears of support contractor effort and provides for those services which support the Headquarters generally, such as: patent services, maintenance and repair of office equipment and vehicles; minor Government services; contract histories; trucking and laboring services; medical services; international support services; contractor incentive awards; Equal Opportunity community relations and fellowships; Administrator's representation allowance; NASA management training facility study; overseas administration support and documentation; and administrative supplies, materials and equipment. The decrease from the 1980 budget estimate to the 1980 current estimate is due to a decrease in supplies and materials. The increase from the 1980 current estimate to the 1981 budget estimate includes funds for the development of Medical Monitoring Criteria and Procedures which involves the development of medical testing and treatment protocols for employees exposed while working with single and multiple toxic substances. The increase is also attributable to increased patent office fees.

1. Installation support services.....	2,418
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This category includes 11 support contractor workyears and provides such services as Administrator's representation allowance, contract histories, minor Government services, labor and traveling services, overseas support, contractor incentive awards, Headquarters Equal Employment Opportunity community relations and fellowships, patent fees and services and Aerospace Fellowships.

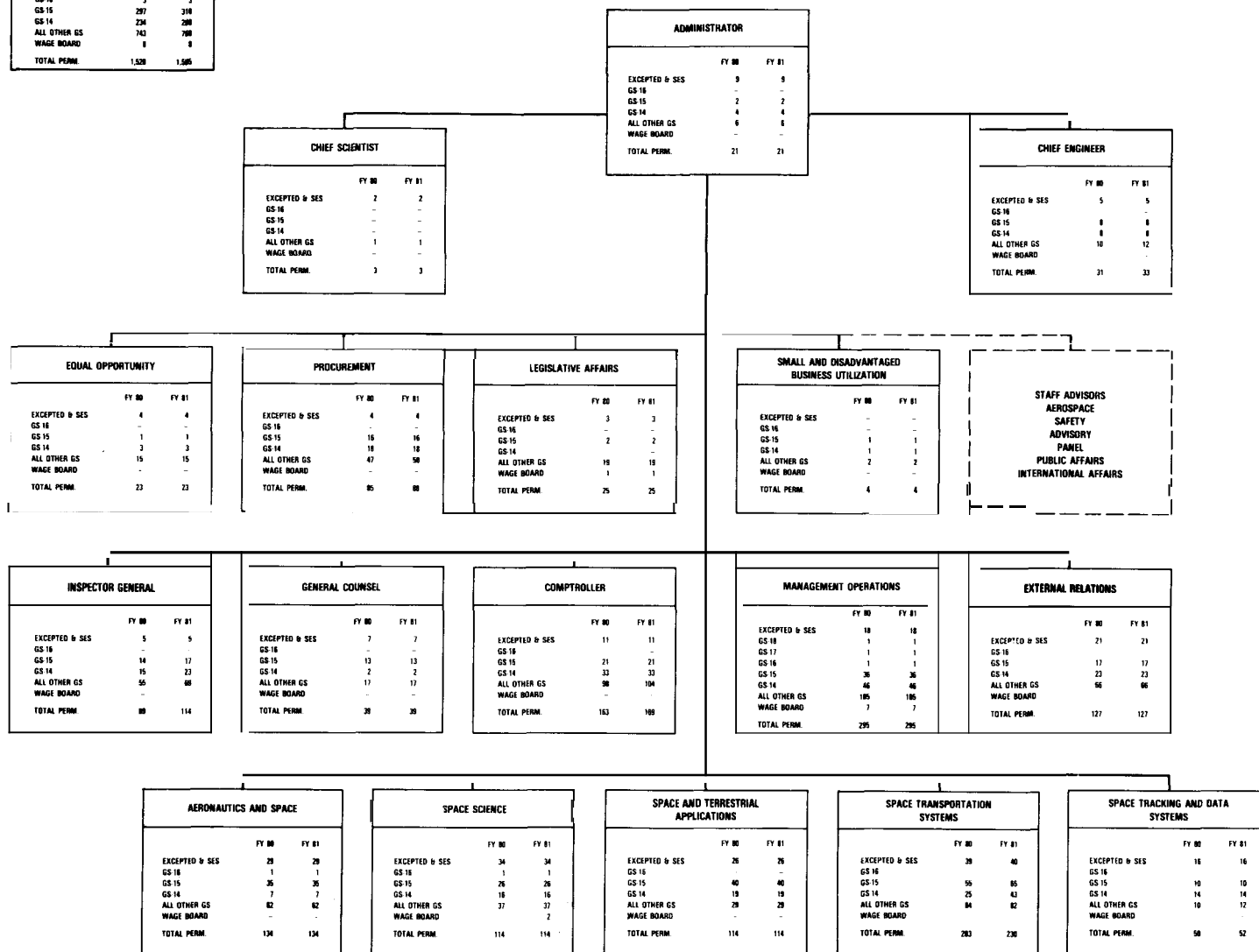
	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. Medical services.				503
<p>This funding includes eight support contractor manyears of effort and provides for the services and required supplies of the medical health unit and includes the cost of the staff examinations support service contract as well as providing funds for the medical monitoring criteria and procedures.</p>				
3. Supplies, materials and equipment.....				1,899
<p>This funding provides for the purchase and rental of office equipment and the supplies and materials required for the operation of NASA Headquarters.</p>				

HEADQUARTERS

SUMMARY STAFFING		
	FY 80	FY 81
EXCEPTED & SES	233	234
GS 18	1	1
GS 17	1	1
GS 16	3	3
GS 15	297	310
GS 14	234	290
ALL OTHER GS	743	790
WAGE BOARD	8	8
TOTAL PERM.	1,520	1,585

ORGANIZATION MO STAFFING

NASA HEADQUARTERS



SPECIAL
ANALYSES

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1981 ESTIMATES

JET PROPULSION LABORATORY

DESCRIPTION

The Jet Propulsion Laboratory (JPL) is located in Pasadena, California, approximately 20 miles north of downtown Los Angeles. Subsidiary facilities are located at Goldstone, California (tracking and data acquisition), Edwards Air Force Base, California (propellant formulation and testing), and Table Mountain, California (open air testing and astronomy).

At Pasadena, the Laboratory occupies 176.2 acres of land of which 155.8 acres are owned by NASA and 20.4 acres are leased. At Goldstone, facilities are located on land occupied under permit from the Army. At Edwards Air Force Base, facilities are located on land occupied under permit from the Air Force. Facilities at Table Mountain are located on land occupied under permit from the Forest Service of the Department of Agriculture. The capital investment of the Jet Propulsion Laboratory, including the Deep Space Network, fixed assets in progress, and contractor-held facilities, as of September 30, 1979 was \$412,400,000.

The Jet Propulsion Laboratory is a Government-owned installation of NASA, but it is also an operating division of the California Institute of Technology (Caltech) staffed with regular Caltech employees. Contract NAS7-100 between NASA and Caltech governs research, development, and related activities at the Laboratory, with facilities being provided under a separate facilities contract NAS7-270(F). The entire cost of operating the Laboratory is borne by the Research and Development appropriation, except for the lease or purchase of administrative aircraft and the purchase of passenger motor vehicles, which costs are funded from the Research and Program Management appropriation and are included in the NASA Headquarters budget presentation. Accordingly, the Research and Program Management type costs presented in this Special Analysis for JPL are for purposes of comparison only, and are not a part of the NASA Research and Program Management budget.

MISSION

The Jet Propulsion Laboratory has been assigned primary responsibility for the conduct of NASA programs concerned with scientific exploration of the planets, and interplanetary space using automated spacecraft. The Laboratory is also assigned to conduct selected automated earth-orbital missions. Implicit in these assignments is a broad range of engineering, scientific, and management functions devoted to:

1. Conduct complete spaceflight projects, including overall project management and all phases of project activity beginning with mission design and scientific justification and following with spacecraft design, development, testing, and flight operations.

2. Develop and operate the Deep Space Network which provides tracking and data acquisition services for all NASA projects involving flights of automated spacecraft beyond near-Earth orbits.

3. Continue programs of scientific investigation and supporting research and technology.

In more specific terms, Laboratory activities in support of NASA can be categorized as follows:

Planetary Exploration - Since the very beginning of the Nation's space activities, the Jet Propulsion Laboratory has devoted a major part of its effort to the Planetary Exploration program. The Mariner series of spacecraft was designed and developed by JPL, and the Laboratory has had project management responsibility for all Mariner missions, including the functions of integration, assembly, and testing of the spacecraft. The two most recently completed missions in the Mariner series are those of Mariner 9, which returned scientific data for nearly a year from an orbit around Mars, and Mariner 10, which gathered data in a close flyby of Venus followed by three separate encounters with Mercury.

The Laboratory has been a major participant in the Viking project, carrying out among other assignments the development of the two Orbiters which, with the two Landers, reached Mars during the summer of 1976. Although the primary and extended Viking missions have been successfully concluded, one Orbiter and both Landers continue to be operational at a low level of activity.

In the continuing series of planetary missions, the Jet Propulsion Laboratory has management responsibility for the Voyager Jupiter-Saturn missions. Two spacecraft were launched on August 20 and September 5, 1977, and encountered Jupiter in close flybys of the planet and its major satellites on March 5 and July 9, 1979. The encounters were extraordinarily successful in obtaining high resolution color photographs and other scientific data as planned. The launches occurred as intended during a time period when the relative positions of Jupiter and Saturn were uniquely favorable for the utilization of gravity-assist techniques to shorten flight times to Saturn. Both spacecraft are operating well and are on their planned trajectories to Saturn where they will arrive in November 1980 and August 1981. The mission design includes an option to adjust the trajectory of the second spacecraft as it nears Saturn and enable it to continue on to Uranus. The spacecraft for these missions make maximum use of previous Mariner and Viking Orbiter designs and technology, consistent with the requirements of long-range communications, solar independent power, and the required flight times.

The Jet Propulsion Laboratory also has project management responsibility for the Galileo mission, which was a new project start in FY 1978. This mission is designed to orbit the planet Jupiter and send an instrumented probe into the planet's atmosphere. The atmospheric probe will make direct measurements of physical and chemical properties and will be designed to survive to a considerable depth. The orbiter will have a lifetime in orbit of some 20 months during which it will observe Jupiter and several of its major satellites at close range.

The International Solar Polar Mission is a cooperative effort with the European Space Agency (ESA). JPL has mission management responsibility as well as responsibility for the U.S. spacecraft and science. ESA has responsibility for the European spacecraft and science. The two spacecraft are scheduled to be launched early in 1983. They will utilize gravity-assist techniques at Jupiter to attain solar orbits nearly normal to the ecliptic plane, thus enabling scientific observations of the polar areas of the Sun and heretofore unexplored regions of interplanetary space.

Scientific Satellites - Consistent with its role as an alternate Center for Earth-orbital spacecraft development, the Laboratory has been selected to manage the Infrared Astronomical Satellite (IRAS) project. This project also involves international cooperation, with the spacecraft bus being designed and built in the Netherlands. The NASA Ames Research Center will be responsible for the infrared telescope. Development activities are in progress, and launch is scheduled for 1981.

The Laboratory also is the project manager for an atmospheric science satellite, named the Solar Mesosphere Explorer (SME), which is scheduled for launch in 1981 into a Sun-synchronous polar orbit. The spacecraft module is under contract, and the science instruments are being developed by the University of Colorado.

Space Applications - In support of the NASA Space Applications program, JPL is one of the principal centers for work in oceanographic applications of space technology. The Laboratory also conducts significant activities in upper atmospheric research; in the planning, development, and implementation of remote sensing techniques to observations of the Earth; and in the development of a strong geodynamics research program.

Supporting Research and Technology - The Jet Propulsion Laboratory maintains a strong program of supporting research and advanced technical development designed to provide sound technologies for present and prospective project assignments, and to further the general capabilities of NASA. Areas of involvement include spacecraft advanced development, autonomous systems, space power and propulsion systems, electronics, information systems technology, and basic research in such fields as fluid physics, polymer materials, and applied mathematics.

Science Program - The Laboratory participates in scientific experiments on both JPL-managed and non-JPL, managed flight projects. This participation includes not only the performance of scientific investigations

but also a significant commitment to the development of scientific instruments for use in space missions. Ground-based research programs are carried out in the planetary sciences, physics and astronomy, and Earth and ocean physics. These activities involve broad collaboration with the scientific and academic communities and with staff members from other NASA field installations.

Spaceflight Operations - The Jet Propulsion Laboratory is responsible for the design, development, maintenance, and operation of NASA's worldwide Deep Space Network and a Mission Control and Computing Center. Tracking stations are located in California, Spain and Australia. These facilities provide support not only to JPL-managed flight missions, but also to projects such as Pioneer and Helios managed by other NASA installations and involving flights beyond near-Earth orbits. The Mission Control and Computing Center is located in Pasadena.

Distribution of Permanent Positions by Program

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	<u>Current Estimate</u>	1981 <u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	4	---	---	---
Space Shuttle.....	4	---	---	---
<u>Space Science</u>	1,148	1,104	1,108	1,160
Physics and astronomy.....	162	177	197	202
Planetary exploration.....	964	908	882	931
Life sciences.....	22	19	29	27
<u>Space and Terrestrial Applications</u>	224	171	245	233
Space applications.....	212	157	235	227
Technology utilization.....	12	14	10	6
<u>Aeronautics and Space Technology</u>	266	261	298	299
Aeronautical research and technology.....	21	15	12	5
Space research and technology.....	229	230	265	265
Energy technology.....	16	16	21	29
<u>Space Tracking and Data Systems</u>	392	391	413	415
Tracking and data acquisition.....	392	391	413	415
Subtotal, direct positions.....	2,034	1,927	2,064	2,107

	1979 <u>Actual</u>	1980 <u>Budget Estimate-</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
<u>Direct Support</u>	559	620	590	582
<u>Center Management and Operations Support</u>	<u>1,093</u>	<u>1,151</u>	<u>1,126</u>	<u>1,110</u>
Total, permanent positions.....	<u>3,686</u>	<u>3,698</u>	<u>3,780</u>	<u>3,799</u>

Summary of Fund Requirements

	1979 <u>Actual</u>	1980 <u>Budget Estimate</u>	1980 <u>Current Estimate</u>	1981 <u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.	114,547	113,934	126,168	126,855
11. Travel.....	4,132	3,800	4,805	5,572
111. Facilities Services..	10,224	10,577	13,004	15,272
IV. Technical Services.....	2,847	2,966	3,074	3,319
V. Management and Operations	<u>6,465</u>	<u>6,181</u>	<u>6,639</u>	<u>6,850</u>
Total, fund requirement.....	<u>138,215</u>	<u>137,458</u>	<u>153,690</u>	<u>157,868</u>

SIMULATED RESEARCH AND PROGRAM MANAGEMENT BUDGET

EXPLANATION OF CHANGES

Personnel and Related Costs - The increase from the 1980 budget estimate to the 1980 current estimate is attributable to: (1) higher average salaries resulting from merit increases in 1979; (2) a higher manpower estimate for 1980; and (3) an increase in cost of benefits associated with (1) and (2). The decrease from 1980 current estimate to 1981 budget estimate is attributable to the reduction of positions planned in 1981.

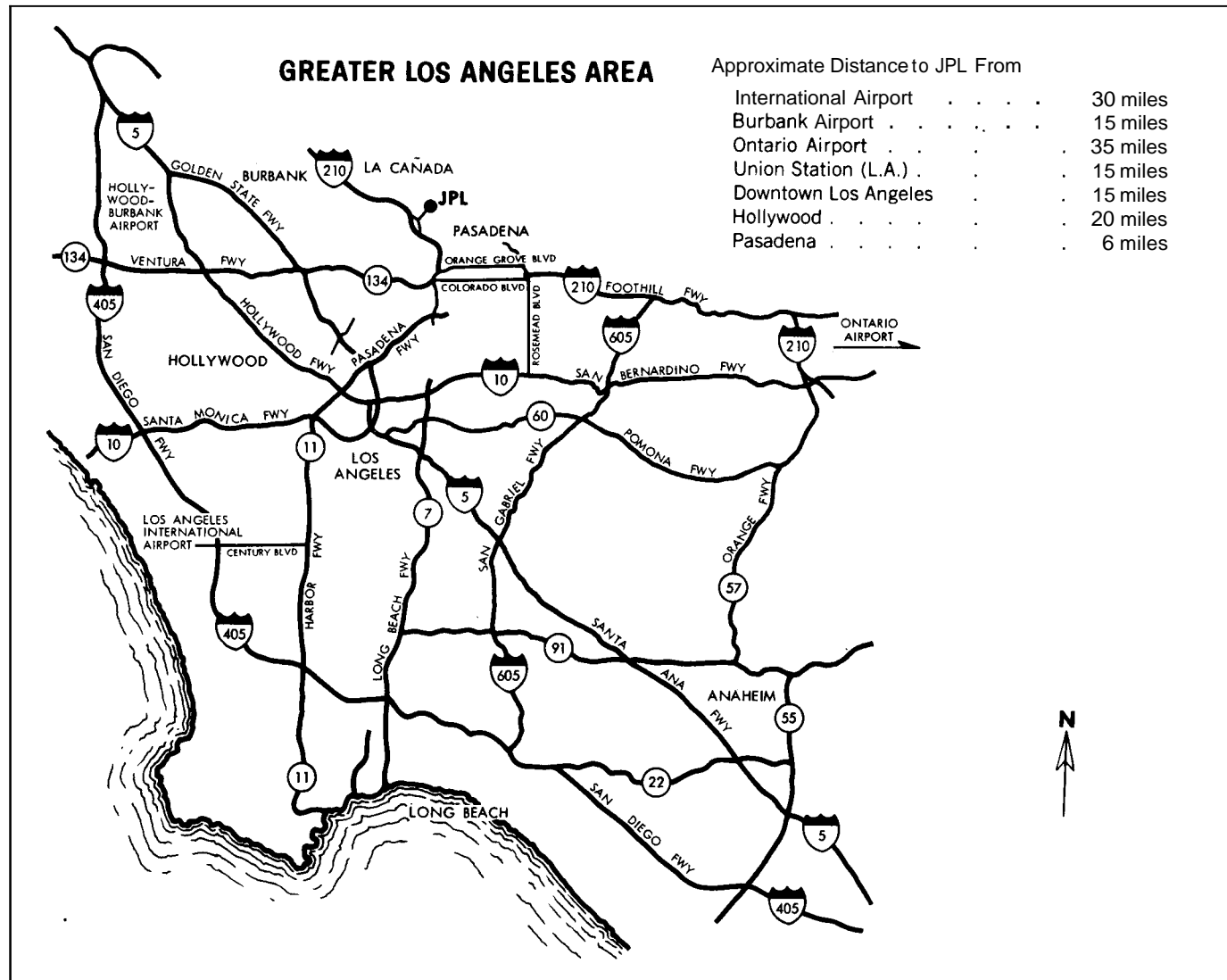
Travel - Travel remains at approximately the same level of effort with increases associated with higher airfares, lodging rates, and rental car **costs**.

Facilities Services - The increases from the 1980 budget estimate to the 1980 current estimate, as well as the increase in the 1981 budget estimate are required for the cost of maintenance, alterations and repairs, and for operation of facilities, including utilities costs. Also included is a minor portion for upgrading laboratory equipment,

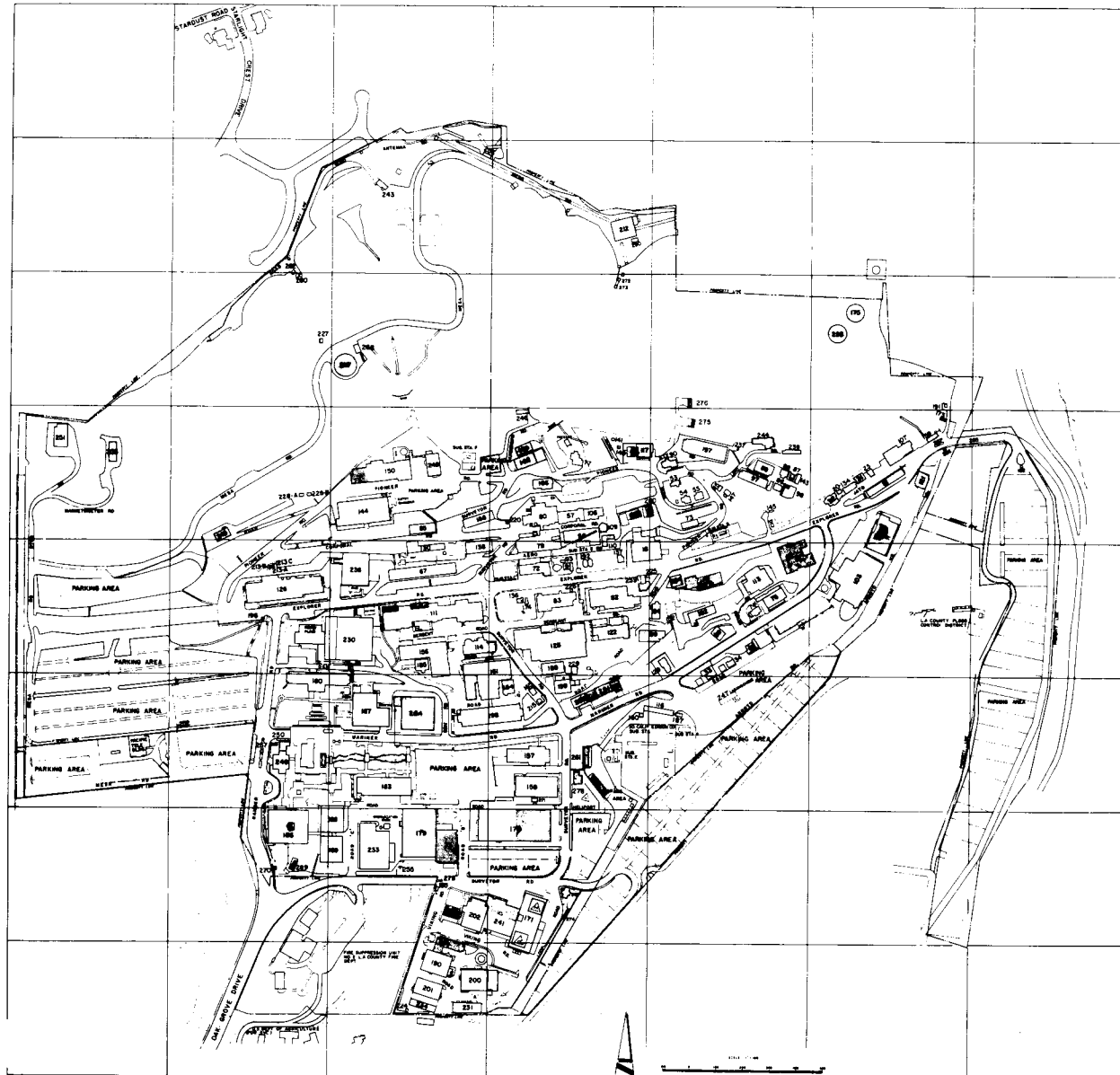
Technical Services - The increase is based on inflation for the same level of services now available.

Management and Operations - The increase is based on inflation for the same level of management and operations activities with a slight increase in communication activities.

JET PROPULSION LABORATORY



JET PROPULSION LABORATORY LOCATION PLAN



JET PROPULSION LABORATORY LEGEND

Bldg. No.	Title	Location	Bldg. No.	Title	Location	Bldg. No.	Title	Location	Bldg. No.	Title	Location
11	Space Sciences Lab	E-2	103	Fabrication Shop	E-3	177	Transportation Garage	D-2	249	Visitor Reception Bldg	E-2
13	Officer. Lab & Shop	D-3	106	Test Cell (Air Fuel)	C-2	179	Spacecraft Assy Facility	B-3	250	Guard Shelter	A-2
18	Structural Test Lab	D-2	107	Test Cell	E-2	180	Central Engineering Bldg	B-3	251	Gyro Lab	A-2
20	Shop Test Cell No. 2 (Liq)	D-2	109	Cooling Tower (Wind Tunnel)	C-2	182	Bus Stop Shelter	E-2	253	Low-Mag Interference Lab	A-2
23	Shop Test Cell No. 12 (Liq)	E-2	110	Fuel Stor Tank	C-2	183	Physical Science Lab	B-3	255	Sewage Lift Station	B-2
31	Test Cell (Liq)	E-2	111	General Offices Bldg	B-2	184	Electronic Stores	C-3	256	Model Range Control Bldg	A-1
32	Test Cell (Liq)	D-2	114	Cafeteria & Offices	C-3	185	Programming Office	B-3	257	Guard Island	B-3
33	Test Cell (Liq)	D-3	115	Heating Plant (Solid)	D-2	186	Space Sciences Div Bldg	A-3	258	Water Reservoir	C-2
34	Shop Test Cell No. 33 (Liq)	D-3	116	Propellant Storage Dock	D-3	187	Chemical Storage	D-3	259	Liquid Nitrogen Bottling Stor	D-2
35	Mag Flux Tank Shelter	B-1	117	Test Cell (Solid)	D-2	188	Engineering Facilities Bldg	C-2	260	Illuminator Equipment Bldg	B-1
41	Hi-Temp Lab	D-3	118	Cooling Tower	C-3	189	Electronics Lab - Annex	C-3	261	Material Storage	C-3
42	Test Cell (Liq)	D-3	120	Cooling Tower	D-2	190	190A - Procurement Offices	B-4	262	Radiometer Bldg	B-1
46	Shop Test Cell No. 42 (Liq)	D-3	121	Employment Development Ctr	E-2	191	Hazardous Test Bay	E-2	263	Protective Services Bldg	C-3
47	Plant Protection	D-2	122	Engineering Offices	C-3	192	Propulsion Engineering	D-3	264	SFOF Sys Dev Lab	B-3
53	Conditioning Lab (Solid)	D-3	125	Combined Electronics	C-3	195	Guard Shelter	B-3	267	Water Reservoir	B-2
54	Blending Lab (Solid)	D-2	126	Systems Div Office Bldg	B-2	196	Guard Shelter	B-2	268	Pump House	B-1
55	Mixing Lab (Solid)	D-2	129	Test Cell (Chemistry)	D-3	197	Solid-Propellant Process Lab	D-2	269	Grounds Maintenance Bldg	C-4
57	Test Cell (Air Fuel)	C-2	130	Engineering Offices	C-2	198	Guidance Lab	C-3	270	Sewage Metering Station	A-J
58	Compressor Bldg	C-2	133	Service Dock	C-2	199	Celestial Simulator Bldg	C-3	271	Oil Barrel Stor	C-3
59	Chemistry Lab	D-3	134	Shop Test Cell	E-2	700	Plant Engineering Services	B-4	272	East Illuminator Bldg	C-1
65	Materials Lab	D-3	135	Guard Shelter	A-2	201	Carpenter Shop	B-4	273	East Illuminator Tower	C-1
67	Microbiology Facility	B-2	136	Cooling Tower	C-2	202	Procurement Offices	B-4	274	Cooling Tower	C-3
71	Mechanics Stores	D-2	137	Cooling Tower	C-2	209	Illuminator Tower	D-1	275	Chemical Stor Prop Bldg	D-2
72	Engineering Offices	C-2	138	Engineering Offices	C-2	210	Blaine Track	D-1	276	Chemical Stor Prop Bldg	D-2
73	Utilities Area Storage	D-2	140	Magazine X Temp	C-2	212	Antenna Lab	D-1	277	Isotope Thermoelectric Lab	D-2
74	Test Cell (Chemistry)	D-3	141	Magazine X Temp	C-2	213	Cooling Tower 'A', 'B' & 'C'	B-2	278	Helicopter Maint Hangar	C-3
77	Soil Science Lab	C-2	145	Magazine Propellant	D-2	218	Credit Union	B-3	279	Guard Island	B-3
78	Hydraulics Lab	D-3	147	Cooling Tower	D-2	220	C. R. S. Terminal Bldg	C-2	280	Static Test Tower	D-2
79	Wind Tunnel (20 inch)	C-2	148	Energy Conversion Lab	C-2	224	Sewer Lift Station	B-4	281	Fireman / Guard Station	C-3
80	Wind Tunnel (21 inch)	C-2	150	25-11 Space Simulator	B-2	225	Guard Shelter - Mesa	C-1	283	Metal Storage Building	C-3
81	Battery Laboratory	E-2	152	Hazardous Chemical Stor	C-3	226	Solvent Storage Bldg	C-2	284	Transportation Office Bldg	D-2
82	Environmental Test Lab	C-2	156	Computer Program Office	B-3	227	Guard Shelter	B-1	285	Arroyo Bridge	E-2
83	Electronic Parts & Engineering	C-2	157	Engineering & Mechanics Bldg	C-3	228	Cooling Tower (A & B)	B-2	286	Guard Bldg, Arroyo	E-2
84	Test Cell & Solid Chemistry	C-2	158	Material Research Proc - Lab	C-3	229	Shielded Room Bldg	C-3	287	Island Guard Bldg	E-2
85	Business Systems Office	C-2	159	Pump House (Water)	E-2	230	Space Flight Operations Facility	B-2	288	Project Equipment Storage	C-2
86	Oxidizer Grinding (Solid)	D-2	160	Sewage Lift Station	C-3	231	Point Shop	B-4	'A' Gate	A-3	
87	Ovens (Solid)	C-2	161	Telecommunications Lab	C-3	233	Spacecraft Development Bldg	B-3	'B' Gate	A-3	
88	Mixing Lab (Solid)	C-2	165	Cooling Tower	C-3	234	Lumber Stor Bldg	B-4	'C' Gate	B-2	
89	Processing Lab (Solid)	D-2	166	Cooling Tower	C-2	237	Cooling Tower	D-2	'D' Gate	F-2	
90	Shop Test Cell No. 51	D-2	167	Cafeteria	B-3	238	Telecommunications Lab	B-2	'E' Gate	B-3	
91	Air Dryer (Wind Tunnel)	C-2	168	Space Sciences Instrmt Sys Lab	B-3	239	Low-Temp Solid Prop Mag	D-2	'F' Gate	B-2	
92	Cooling Tower (Wind Tunnel)	C-2	169	Engineering Office Bldg	B-3	241	Shipping & Receiving	B-4	'G' Gate	A-2	
93	Vaporizer (Wind Tunnel)	C-2	170	Fabrication Shop	C-3	243	Remote Antenna Range Contr	B-1			
97	Development Lab & Offices	C-2	171	Materials Service Bldg	C-4	244	Hi-Temp Stor Mag	D-2			
98	Preparation Shop (Solid)	D-2	173	Test Shelter	E-2	245	Spectroscopy Lab	B-2			
99	Chemistry Lab (Solid)	C-3	174	Cooling Tower	C-2	246	Soils Test Lab	C-2			
			175	Water Reservoir	E-2	248	10-ft Space Simulator	C-2			

JET PROPULSION LABORATORY



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1981 ESTIMATES

SUMMARY OF AERONAUTICAL RESEARCH AND TECHNOLOGY
OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

	1979	1980		1981
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Millions of Dollars)		
Research and development.....	264.1	300.3	308.3	290.3
Construction of facilities.....	76.5	62.5	62.5	45.3
Research and program management.....	<u>178.5</u>	<u>194.1</u>	<u>199.5</u>	<u>207.7</u>
Total.....	<u>519.1</u>	<u>556.9</u>	<u>570.3</u>	<u>543.3</u>
Number of direct positions (end of year) associated with aeronautical research and technology.....	<u>3,723</u>	<u>3,772</u>	<u>3,733</u>	<u>3,772</u>

'The objectives of the Aeronautical Research and Technology program are to provide the Nation with the necessary technology for safer, more economical, more efficient, and environmentally acceptable air transportation; to maintain a strong U.S. competitive position in the international aviation marketplace; and to support the Department of Defense in maintaining the superiority of U.S. military aircraft.

The 1981 program supports these objectives by stressing the technology areas judged to be the most critical by special assessments, advisory groups, and by industry and other users of technology within and outside the Federal Government. The 1981 activities are designed to maintain a strong research and technology base position in the various technology disciplines. Strength in this fundamental research and technology is essential to the future development of new, improved aeronautical products. Emphasis will be placed on improving aircraft energy efficiency and performance; reducing noise and pollution; improving safety and terminal area operations; and on advancing long-haul and short-haul air transportation concepts.

In the area of transport aircraft technology, efforts to reduce aircraft noise and emissions, to improve terminal area safety and aircraft operations, and to evaluate the suitability of broad specification jet fuels for use in current and future commercial jet engines will continue. Major emphasis will be on aircraft energy efficiency technology efforts, including further testing of individual components to validate the technology for use in high-bypass turbofan engines as part of the energy efficient engine program and the evaluation of active control technologies in the energy efficient transport program.

Rotorcraft activities will continue to address rotor aerodynamics, structures, avionics, flight dynamics, terminal operations, engines and drive systems and rotor system design with new emphasis in FY 1981 on analytical modeling and systems verification. General aviation activities will emphasize the reduction of noise and emissions, improved crashworthiness, and an expanded stall/spin data base. In vertical take-off and landing technology, broad based technology for future military and civil aircraft applications will be continued. Supersonic cruise research will place emphasis on the interactions between the airframe and propulsion system, long-life structural tests, and the development and demonstration of critical low-speed technologies unique to variable cycle engines. Also, efforts in the area of high performance aircraft will continue on configuration aerodynamics and flight testing of highly maneuverable aircraft technology concepts.

The construction of facilities program for 1981 in support of aeronautical research and technology objectives includes completion of the modifications to the central air system at the Lewis Research Center, Cleveland, Ohio, for which initial funding was provided in **N** 1980. The 1981 program also includes construction of a man-vehicle systems research facility, modification of the steam ejector system and thermal protection laboratory, and modification of the unitary plan wind tunnel at the Ames Research Center, Moffett Field, California; modifications to the avionics integration research laboratory, modifications to the aircraft landing dynamics facility, and completion of rehabilitation and modification of the gas dynamics laboratory at the Langley Research Center, Hampton, Virginia; and rehabilitation of electrical switchgear in the engine research building at the Lewis Research Center.

The research and program management funding provides for the civil service salaries, travel, electric power for wind tunnel operations, and other general installation costs necessary to conduct the aeronautics program.

RESEARCH AND DEVELOPMENT

ESTIMATED FY 1981 OBLIGATIONS FOR EQUIPMENT TO BE PLACED AT NASA INSTALLATIONS

<u>Program Budget Line Item</u>	1981 (Thousands of Dollars)
<u>Space Transportation Systems</u>	<u>95,494</u>
Space Shuttle	(52,552)
Space Flight Operations	(42,942)
Expendable Launch Vehicles	(0)
<u>Space Science</u>	<u>7,953</u>
Physics and Astronomy	(4,559)
Planetary Exploration	(799)
Life Sciences	(2,595)
<u>Space and Terrestrial Applications</u>	<u>15,213</u>
<u>Aeronautics and Space Technology</u>	<u>37,551</u>
Aeronautical Research and Technology	(30,288)
Space Research and Technology	(7,168)
Energy Technology	(95)
<u>Tracking and Data Acquisition</u>	<u>18,230</u>
GRAND TOTAL	<u><u>174,441</u></u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1981 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING 'INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1981 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Shuttle	Johnson Space Center Bldg. 30, 72-78-03	Orbiter Data Reduction Complex	Computers to support post flight orbiter data reduction.	900	FY 1978 Modifications to adminis- trative Bldg. 30. Coff Project 9370
Space Flight Operations	Johnson Space Center Bldg. 30, 72-77-04	Telemetry Processing Equipment	Provides interface between mission control center and space tracking data network.	1200	FY 1980 Modifications to MCC, Bldg. 30. Coff Project 9370
Space Flight Operations	Johnson Space Center Bldg. 30, 72-77-05	Master Interface Timing	Provides central timing system for the mission control center.	55	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-01	Wide Band Recorder/ Switch	Provides capability for switching and recording all data input to the mission control center.	1028	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-02	Display Control/Shuttle Data Processing Complex Interface	Provides display control system and its interface to Shuttle Data Processing Complex	2182	

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SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1981 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1981 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 5, 72-78-07	Spacelab Simulator (SLS)	Simulator to train flight and ground crews for the operation and monitoring of Spacelab subsystems.	900	FY 1978 Modifications to accommodate Spacelab Support Module Simulator Bldg. 5
Space Flight Operations	Johnson Space Center Bldg. 30, 12-19-05	Flight Planning System III	Purchase of special equip- ment for design and documentation of missions with the intent of increasing the design capability to 60 flights/year.	1000	
Space Flight Operations	Johnson Space Center Bldg. 30, 12-19-06	Hardcopy Unit	To provide hardcopy of Digital Data Display from the SDPC.	284	

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Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-07	Payload Operating Control Center (POCC) Computer	To provide the capability to process command and control parameters from several independent payload data streams simultaneously.	10	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-08	POCC Communications Interface	To provide capability to bring independent payload high rate data stream into JSC POCC.	1544	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-09	Payload Data Interleaver System	Downlink system to accept and process digital data from Shuttle PDI.	586	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-10	Text and Graphics System	System to provide for uplink of text and graphics information to the Shuttle.	610	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-81-02	POCC Display Control	To provide display monitoring capability for experiment systems data.	443	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-81-01	Reconfiguration Data Collection System (RDCS)	A computer system used to collect reconfiguration data and to construct tables necessary for the recon- figuration of the Mission Control Center.	120	
Space Flight Operations	Johnson Space Center Bldg. 12, 72-81-03	Univac 1108 Upgrade	Replacement of the central processing units and peripherals on Central Computing Complex.	960	

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Physics and Astronomy	Goddard Space Flight Center 51-81-01	Science and Applications Canputing Center (SACC) upgrade	Replace SACC equipment with new computer system that will include an an- line mass storage device to meet OSS program requirements.	4140	Funding also supported by Planetary Exploration
Space Applications	Goddard Space Flight Center Bldg. 28, 51-81-02	VAS Assessment Processor	Utilization of geosynchronous VAS data in model impact studies.	112	
Space Applications	Goddard Space Flight Center Bldg. 22, 51-81-03	Goddard Modeling Activity Advance Computer System	Supplants and extends capability of existing Amdahl 470V/6 for applications in atmospheric sounding retrieval, data set assembly, atmospheric modeling, numerical forecast development in support of Global Atmospheric Research Program (GARP) and NASA climate Research Program.	2850	
Space Applications	Goddard Space Flight Center Bldg. 22, 51-81-04	Goddard Modeling Amdahl Computer System	Lease and rental of major ADP System. (see 51-81-03)	281	
space Applications	Goddard Space Flight Center Bldg. 22, 51-81-05	Goddard Modeling Terrabit Memory	For use on Amdahl Computer system to provide memory storage and retrieval to support additional programs.	250	
Space Applications	Goddard Space Flight Center Bldg. 28, 51-81-06	Landsat-D Ground Support System	System to support Landsat-D Mission. Specific require- ments under development.	10200	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1981 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1981 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Aeronautical Research and Technology	Ames Research Center Bldg. N-233, 21-81-01	IBM 3033, or an equivalent performance general purpose computer system	Provides compatibility with present peripheral equipment and interactive operating system for interaction, on- line computing for wind tunnels, graphics, space shuttle, and general purpose computing at the Center.	5400	Funding also supported by Space Research and Technology and other programs.
Aeronautical Research and Technology	Marshall Space Flight Center Bldg. 4663, 62-81-01	Cal Comp Disc Systems	Provides mass storage capability for the U-1108 Computer.	204	Funding also supported by Space Research and Technology, Energy Programs, and CSTS
Space Research and Technology	Marshall Space Flight Center Bldg. 4700, 62-80-02	PDP VAX 11/780 - NEEDS Data Base Management System	Required for Phase II of the End-to-End Data System (NEEDS) program, which is a program to develop an advanced real- time space data acquisition system.	800	

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SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1981 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1981 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center Bldg. 14, 51-80-04	Space Telescope Operations Control Center Data System	Required to conduct the real-time operation of the Space Telescope Observatory with planned mission life of 15 years. The data system will require new space area of 5,000 square feet.	4700	Space available
Tracking and Data Acquisition	Goddard Space Flight Center Bldg. 23, 51-81-01	New system to capture Spacelab payload data up to 50 Mbs, peak, of composite experiments, demultiplex and preprocess.	Required for support for early Spacelab missions.	3230	Space available
Tracking and Data Acquisition	Goddard Space Flight Center Bldg. 14, 51-81-02	Mission Operations Computing Facility (MOCF). Required to replace obsolete Spacecraft Control Computing System and provide more near real time support capability as well as greater reliability and economy of operation.	Provides mission operations support computer capability to GSFC POCC's as required.	3300	Space available

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1981 BUDGET

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Tracking and Data Acquisition	Goddard Space Flight Center Bldg. 14, 51-80-02	POCC Pilot Model (POCCNET). This acquisition is the start of the design and procurement of several mini/midi computers and peripherals to be used as a nucleus for the new POCCNET pilot model POCC. The pilot model will demonstrate the concept of distributed processing, virtual peripherals, common software, shared resources and computer networking.	Required to support the mission control workload in the 1980's and beyond in order to meet quick turnaround, increased support efficiency requirements and to minimize development and recurring costs with each new mission. The POCCNET concept is envisioned as very cost effective in the TDRSS/STS/Spacelab/MMS era.	1900	Space available
Tracking and Data Acquisition	Goddard Space Flight Center Bldg. 14, 51-80-03	Mission Operations Computing Facility (MOCF). Required to replace obsolete Flight Dynamics and Attitude computation system and provide more real time support capability as well as greater reliability and economy of operation.	Provides mission operations support computer capability to GSFC POCC's as required.	3100	Space available
Tracking and Data Acquisition	Wallops Flight Center 53-81-01	Impact Prediction System - Computer with Peripherals	Provide real-time impact prediction of sounding rockets launched from WFC.	2600	Space available Funding also supported by OSTA, OAST, and OSS Programs.

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